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MR. D. W. BRUNTON, of Messrs. TAYLOR & BRUNTON, Denver, Colo., has just returned from a professional trip through Southern Mexico.

PROF. WILLIAM P. BLAKE has gone to the Black Hills to revisit the Etta mine and to make a general inspection of the tin region. Until October 15th, he may be addressed at Rapid City, Dakota.

THE annual meeting of the Calumet & Hecla Mining Company was held at Boston on the 20th, and differed but little from earlier gatherings of that kind. The only figures submitted were in the following statement of the financial condition of the company on the 30th of April of this year:

Assets:	
Cash at Boston	$103,504.44
Cash at mine	10,371.78
Copper on hand, 20,811,399 pounds, at 12 cents	2,497,367.88
Bills receivable	2,134.24
	$2,613,378.34
Liabilities:	
Drafts in transit	$21,018.77
Notes payable	374,000.00
Accounts payable (N. S. S., Jr.)	170,581.30
Loans	220,000.00
Balance	1,827,778.27
	$2,613,378.34

Financially, therefore, the company is in a very strong position. The large amount of copper on hand might appear surprising. It must be remembered, however, that it is probably the accumulated stock of the mine for the long period during which lake navigation is closed. The company has adhered to the policy of withholding from its shareholders even such figures as the gross receipts and expenditures and the amount of profits, so that it remains impossible to frame any opinion as to cost. The president, Prof. ALEXANDER AGASSIZ, made a verbal statement concerning the expenditures for openings, new lands, timber, and equipment, and after close questioning on some points with satisfactory results, a resolution was unanimously adopted at the close of the meeting approving of the management in the past and hoping for a continuance of the same on similar principles. It is understood that the equipment, which caused so heavy an outlay during the past years, has now reached such a point that after the end of the year practically little expenditure in this direction will be needed. The only work partly reserved for next year will, we suppose, be the completion of the stamp-mill on the basis of twelve Leavitt heads. How far advanced the completion of the entire equipment is, our readers will have gathered from our recent description of it.

At the meeting, the old board of directors, consisting of ALEXANDER AGASSIZ, QUINCY A. SHAW, G. HIGGINSON, H. H. HUNNEWELL, and J. N. WRIGHT, were re-elected. At a subsequent meeting of the directors, A. AGASSIZ was re-elected president, and C. W. SEABURY treasurer. Mr. CHANNING CLAPP was elected to the new vice-presidency recently created.

THE ALLOTMENT PLAN OF RESTRICTING THE PRODUCTION OF ANTHRACITE.

Some weeks since, we gave voice to the growing dissatisfaction among the anthracite coal trade with the present methods of keeping the production within the demands of consumption. The past few weeks have done much to convince those who doubted and to silence those who were violently opposed to any change. They have proved statements made by us against which many in the trade seemed inclined to close their eyes with obstinacy. With the record of weeks of steady work before him, is there any one worthy of being entitled to an opinion who would be willing to deny that, in the face of years of enforcement of partial idleness, the capacity of the anthracite collieries has increased steadily? There must be something radically wrong in a system that allows the facilities for output to go on extending at a more rapid rate than consumption, even at its best, can cope with, and that, too, at a time when the demand has actually been shrinking, and nothing but frequent stoppages have kept prices from going to pieces. Last year, from 725,000 to 750,000 tons a week was a fair rating of the capacity of the collieries. Now, from 800,000 to 825,000 tons a week will probably be conceded by the most conservative. It would be idle to deny that this state of affairs is due to the eagerness of all the companies to gain in tonnage. They have all bent their energies to extending plant and facilities so that they can "rush" into the market a great quantity of coal whenever it is supposed to be able to stand full work. We have dwelt upon the evils of this system, entailing as it does an enormous expense in the maintenance of a really unnecessary equipment. We are sure that it is costing the companies many millions of dollars every year, and that, if matters are allowed to drift on as they are doing at present, it means ruin to some and a very heavy falling off in profits to others. In our former article, we briefly pointed out that the plan of providing for the distribution of tonnage to the different companies by allotment would overcome the dangers of the present system. We alluded then to the fact that some of the companies had suffered more seriously than others, the most striking example of its disastrous effects being the Reading Company. It is probably not too much to say that its adherence to the prevailing system of restriction has had no small share in bringing it to the condition, financially, that it has reached. On the other hand, it must not be forgotten that its present position is one that gives it greater power to insist upon a full recognition of its claims for a change more favorable to its interests. We are convinced that the Reading Company and those which, like it, control a large line trade, are entitled to and will demand a readjustment that will do away with disturbances of that trade.

The allotment plan has been suggested as probably the best means of avoiding the expense and the dangerous tendencies of the present system. When it is considered, as we feel sure that it will be soon and seriously, two methods will possibly become topics of discussion. Shall the allotment be made on the whole output, or shall it embrace only such tonnage as may be fairly termed competitive? The former plan has the advantage of great simplicity, and therefore would present little difficulty in its execution. We have shown how small for years have been the variations in the percentages of the total tonnage controlled by those who are in accord on the present system of restriction by periodical stoppages. The figures could be agreed on at a single sitting.

The second plan demands a fuller presentation. It starts from the idea

that the settlement upon any allotment must be preceded by the acceptance of the principle that no company should have a voice in the management of a market in which it has no direct interest. It is claimed that a broad distinction should be made between what we may term local and competitive markets. All that part of the coal mined that goes to lake points for distribution, to tide-water on the Delaware or Hudson rivers, and therefore to points in New England and elsewhere, is what may be classed as competitive coal. The remainder, which is the supply for interior or local markets, should be left free to those who are most naturally interested in taking care of it.

In Pennsylvania, the Reading and Lehigh Valley companies, for instance, have a market distinctively their own. In Northern Pennsylvania and New York, the Erie, Delaware, Lackawanna & Western, and Delaware & Hudson companies reach more or less the same country.

An allotment that would recognize this distinction would undoubtedly be more complicated, but it would be manifestly more just. It would be based on the business-like proposition that it must be a matter of indifference to a company that can not reach a given territory whether those who can are shipping more or less to that district. To those who do that local trade it is, however, a vital matter. The demand in that particular locality might, by special circumstances entirely unconnected with the general coal trade, be such that the company supplying it could not participate in the competitive markets to the extent contemplated in the general allotment plan. Such a company would, therefore, be practically sharing the advantages of an improvement in its own domain with others who could not in any possible way reach it. Any one acquainted with the distribution of anthracite coal will be ready to admit that this is not a fanciful assumption of what might happen under extraordinary circumstances. It is a question involving large interests.

It will be urged, and we are willing to admit, that it would introduce complications. But the anthracite coal trade is an aggregate of many and partially conflicting interests. An off-hand way of attempting to harmonize them, though it might have the charm of simplicity, would inflict serious injury on many. What an element of tension this introduces may be well understood when we state that for some years the managers of the coal companies have dreaded to meet to discuss trade subjects for fear of stormy scenes threatening the continuance of even the form of harmonious action among them.

The allotment plan foreshadowed in our former article has been criticised on the ground that it offers peculiar facilities for the violation of the good faith that it absolutely presupposes. It is true that the manager of every company must carry out the spirit of the agreement on his own individual responsibility, without any reference to what others are doing, and all must act in concert to promote the interests of the general good. If they can only be kept honest by being linked together, their ethics are, indeed, faulty. We believe that a fair plan of controlling local trade as to output and price, without reference to other districts, can be carried out without affecting the condition of the general market. If the managers can not keep the latter in shape by honestly adhering to their engagements, they do not deserve any thing but the ruin that would be the inevitable result. With the condition of some of the companies staring them in the face, the solvent ones can only avert a similar fate by making sacrifices for the common good.

These are, briefly stated, some of the questions that should come up for discussion at an early date. The present plan has become so intolerable, and is so injurious, that it is the duty of the managers of the coal trade, in justice to the interests confided to their care, to cast about for something better. Whether they adopt one or the other of the methods propounded, either will certainly be an improvement. Whichever is chosen must depend on the sacrifices that some may be ready to make for the good of all, or on the recognition of the special interests of a few by the others. The former would result in an allotment of the entire tonnage; the latter, in the withdrawal from allotment of special coals and all coal consumed in local markets. As we have already indicated, the former commends itself on account of its simplicity; the latter, by reason of its manifest justice. The present vicious system of stoppages, also, may claim the advantage of simplicity; but its injustice to important interests is one of the main causes of constant irritation and dissatisfaction. Only by the greatest forbearance on the part of the managers has a rupture been prevented more than once. It seems to us certain that a continuance of this system can only end in exhausting the patience of the managers and precipitating a condition of affairs disastrous to the whole trade.

OXYGEN IN IRON.—Recent investigations, says Mr. I. Lowthian Bell, have led chemists to ascribe, among other causes, the want of malleability—or red-shortness, as it is termed—in heated iron to the presence of oxygen gas in some form or another. Three specimens made at the Monkbridge Works, one of them red-short, were recently sent to me for examination, and their composition entirely confirmed the soundness of this opinion. On analysis, the two samples that were free from this defect contained only 0·750 and 0·704 per cent respectively of oxygen, while the one complained of gave 1·384 per cent.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

Bogus Reports on Tin Property.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The discovery of tin ore in the Black Hills has led to much active prospecting of the region during the summer; and there are, no doubt, several distinct localities where the ore occurs. Up to this time, however, very little actual work has been done, except upon the Etta, the original discovery point. Specimens of ore from this mine have, no doubt, been made to represent other localities where it was inconvenient, if not impossible, to find tin ore. It is time, therefore, to give some words of warning to the public, and especially to those persons who may be disposed to invest in tin mining enterprises in the Black Hills. I wish particularly to direct attention to a certain pamphlet, issued without my knowledge, but apparently containing the substance of my communications to your journal last September, upon the discovery of tin ore at the Etta mine, Tin Mountain. While having the appearance of authenticity, it is a garbled and misleading issue, in which the name of the Etta claim is suppressed and the descriptions are made to apply to an entirely different group of claims in another part of the hills—claims of which I have no knowledge. There is also a careful elimination of my statement of an average of three per cent of *black tin*, leaving the text in a form to make the average appear to be twice as high. My original descriptions of the Etta discovery, freely given to the public, are thus made to aid unscrupulous persons to dispose of their claims. There may be other similar perversions.

I have seen in samples of ores from various parts of the Black Hills fragments of ore I could identify as coming from the Etta; such tin ore being sufficient to give a fair per cent of tin to otherwise valueless rock. There may be other cases of such misrepresentation, and the public should be very cautious in accepting statements, assays, and reports circulated by strangers and irresponsible parties. The Etta mine, on which my report was made, is now the property of the Harney Peak Tin Mining, Milling, and Manufacturing Company, of New York, and is now being actively developed by that company.

WILLIAM P. BLAKE.

MILL ROCK, NEW HAVEN, Aug. 20.

OFFICIAL STATEMENTS AND REPORTS.

STORMONT MINING COMPANY, UTAH.

After a long period of silence, the managers of the new Stormont Mining Company have furnished the stockholders with a report embracing the period from May 16th, 1882, to May 31st, 1884. It is, on the whole, decidedly disappointing. In two years, the company's mines have produced $421,447.39, while the mine expenses were $389,228, of which $188,966.05 was paid for mine labor, supplies, and repairs, $87,569 48 for mill labor, supplies, and repairs, $36,778.35 for custom ore, $50,910.38 for hauling ore from mine to mill, $5436.43 on general expense account, and $19,567.50 for salaries. After having paid $14,852.20 on account of liabilities of the old company, and remitting $7000 to the treasurer, there was a balance of $10,367 cash. The following is the treasurer's statement:

RECEIPTS AND EXPENDITURES FROM MAY 16TH, 1882, TO MAY 31ST, 1884.

Receipts.

From temporary loans and advances	$50,205.45
Sales of contribution stock, 165,043 shares at 25 cents	41,260 75
Remittances from Utah	7,000.00
Stormont Silver Mining Company, cash and assets transferred at valuation on account advances	2,461.94
Sales of stocks transferred from old company	680.00
Total	$101,608.14

Expenditures.

Paid on account purchase of mine and property, at United States Marshal's sales in Utah	$48,864.20
On account temporary loans and advances	41,842.92
Interest to May 31st, 1884, on loans and advances	3,409 61
Account stocks and furniture taken from old company at valuation	992.00
Account expenses of incorporation, listing stock, register of transfers, certificate books, etc	1,001.70
Account general expenses New York office, including rent, insurance on mill and personal property at Silver Reef, secretary and treasurer's salary, clerk hire, etc	4,468.86
By balance	1,028.85
Total	$101,608.14

A statement of the liabilities shows that the indebtedness of the company is $12,867.89. The president of the company Mr. C. S. Hinchman, summarizes the work of the mine by stating that "such drifting and prospecting work has been done from time to time as the output of the mine would justify," but the few small ore-bodies and rich stringers of ore found soon ran out into very low-grade ore or comparatively barren matter. In the first year, the company's mill treated 13,150 tons of ore averaging $22.08, and in the second year 18,232 tons running $17.85, this low grade of material barely keeping the company afloat, and allowing it to run 2313 feet of prospecting drifts and 1672 feet of prospecting winzes. The president calls attention to the heavy cost of ore-hauling, which is very nearly $2 a ton, while the cost of milling was only $4.18 in the first year and $3.32 a ton in the second. The matter now seems to resolve itself into the question whether the shareholders are willing to put their hands into their pockets once more to pay off the $12,500 debt, and provide funds for more extensive prospecting operations and for a tramway to lighten the cost of hauling. The company has 134.957 shares of its stock in its treasury for which no acceptable price could be realized. Another alternative proposed has been the issue of bonds.

NEW PUBLICATIONS.

A TEXT-BOOK ON THE METHOD OF LEAST SQUARES. By MANSFIELD MERRIMAN, *Professor of Civil Engineering at Lehigh University*, etc., etc. New York: John Wiley & Sons. 1884. 8vo, 194 pages.

Professor Merriman's *Elements of the Method of Least Squares*, published in 1877, was received with general favor, and the sale of the entire edition called for the preparation of a second one. But so many alterations and additions have been made that the present work is, as the author says, "a new and distinct book, rather than a second edition." We can not do better than quote from the preface the summary of these changes. Says Professor Merriman:

"The arrangement of the theoretical and practical parts is entirely different. In Chapters I. to IV. is presented the mathematical development of the principles, methods, and formulas; while in Chapters V. to IX. the application of these to the different classes of observations is made, and illustrated by numerous practical examples. For the use of both students and engineers, it is believed that this plan will prove more advantageous than the one previously followed. Hagen's deduction of the law of probability of error is given, as well as that of Gauss. More attention is paid to the laws of the propagation of error, the solution of normal equations, and the deduction of empirical formulas. Many new illustrative examples of the adjustment and comparison of observations have been selected from actual practice, and are discussed in detail. At the end of each chapter are given a few problems or queries, and in the Appendix are given eight tables for abridging computations."

A cursory examination of the book leads us to believe that the author's claims are well founded. The arrangement appears to be excellent, and the style is, in the main, precise and clear. The only serious lapse that we have noticed is in the definition given (p. 6) of the word "probability," as used in mathematical reasoning, as "a number less than unity, which is the ratio of the number of ways in which an event may happen or fail, to the total number of possible ways; each of the ways being supposed equally likely to occur." Here the author does not say what he means. Strictly, he does not say any thing intelligible. But his meaning is made clear enough by the illustration that immediately follows. It is quite possible that Professor Merriman has adopted this muddy definition from some previous writer less lucid than himself. What he is trying to express is the ratio between the number of ways in which an event may happen, or the number of ways in which it may fail, to the sum of these two numbers, which is the total number of ways in which it may either happen or fail; all (not "each") of the ways being supposed equally likely to occur.

From a philosophical stand-point, we are inclined to make one further criticism, which, however, does not impugn the merit and value of the book for its designed purpose. In common with many other writers on probability, Professor Merriman seems, now and then, to mistake the real meaning of its calculus. Thus, he tells us, concerning accidental errors, that, "although at first sight it might seem that such irregular errors could not come within the province of mathematical investigation, it will be seen in the sequel that they are governed by a wonderful and very precise law, namely, the law of probability." We will not here discuss this proposition, but will content ourselves with saying that, in the sense of a governing rule, we hold that there is no such thing as a law of probability. It would be more accurate to say that the so-called law is simply a formulation of our ignorance, as a means of discussing its extent. It is not a law such as permits scientific prophecy; and the loose way in which it is classed with natural laws is one source of the innumerable fantasies of gamblers and cranks. It is reported to be the basis of Wiggins's weather-wisdom; though this report may do that distinguished seer an injustice. Professor Merriman is too good a mathematician to lend himself to any such misapplications of the calculus of probabilities. His book, thoroughly studied, would cure such notions, not foster them. But he occasionally drops into a phrase that favors the vulgar misconception of this branch of mathematical analysis. *

PETROLEUM FUEL FOR LOCOMOTIVES.

Thomas Urquhart, of Borisoglebsk, Russia, at the Cardiff meeting of the Institution of Mechanical Engineers, read a paper on the Use of Petroleum Refuse as Fuel in Locomotives, which *Engineering* summarizes as follows: In his paper, Mr. Urquhart stated that the first experiments on the use of petroleum for fuel on locomotives were made in 1874 by the author on the Grazi & Tsaritsin Railroad, South Russia, but at that time the great cost of the fuel prevented its extended use. Naphtha refuse has a theoretical evaporative power of 16·2 pounds of water, and anthracite of 12·2 at 120 pounds pressure per square inch; hence petroleum has, weight for weight, 33 per cent higher evaporative value than anthracite. In locomotive practice, a mean evaporation of from 7 pounds to 7½ pounds of water per pound of anthracite is generally obtained, thus showing 60 per cent of efficiency. But with petroleum, the author said, an evaporation of 12·25 pounds is practically obtained, giving 75 per cent efficiency, and hence the practical evaporative value of petroleum must be taken at from 63 to 75 per cent higher than that of anthracite.

The form of spray injectors that had been found by the writer to give the best results was illustrated by diagrams. The combustion-chamber is constructed with fire-brick inside it, which, when heated, acts as a regenerator, retaining the ignited gases long enough to secure their thorough admixture with air. In certain instances, the incoming air at the forward ash-pan damper was heated by passing through a narrow channel in the brick-work. All the locomotive sprays were worked with steam; but in a tire-heating furnace, the author uses an air-blast from a Roots blower. In this, the cost of fuel is only one third of what it was with bituminous coal, and the work done per day has increased 25 per cent. Four spray nozzles are arranged tangentially to the tire, and there is a circulation of flame all around.

To get up steam in a petroleum-fed locomotive, it is temporarily connected with a shunting locomotive or stationary boiler, to obtain steam for the blower and the spray jet. Steam can be raised to 45 pounds in 20 minutes, and to 120 pounds in 55 minutes. If the water be already hot, the full pressure is obtained in 25 minutes. In lighting up, the spray nozzle is first cleared of water by the steam-jet, and at the same time the blower in the chimney is started for a few seconds, to draw the gas, if any, out of the smoke-box. A piece of cotton waste, or a handful of lighted shavings, is put in the combustion-chamber, and the spray turned on; the oil immediately ignites without an explosion, and then its quantity can be augmented at pleasure. When the fuel is turned off, as in descending a long incline, the ash-pan doors are closed, and also the revolving air-damper in the chimney, to retain the heat. When the fuel is turned on again, the box is hot enough to light it.

There are 72 locomotives running with petroleum under the author's care; 10 of them are passenger engines, 17 are eight-wheel coupled goods engines, and 45 are six-wheel coupled. The length of line over which they run is 291 miles, from Tsaritsin to Burnack; and there are four main storage reservoirs, each holding 2050 tons. At each shed, there is a distributing reservoir provided with a gauge-glass and a scale.

The paper ends with a number of tables. The first gives the specific gravity and weight of petroleum refuse at different temperatures. The second is the record of 17 trips, giving a mean consumption of 39·15 pounds per train-mile. The third gives the results of comparative trials of different kinds of fuel in summer and winter. In comparison with anthracite, the saving in favor of petroleum was 55 per cent in cost, and 41 per cent in weight. With bituminous coal, there was a difference of 49 per cent as to weight, and 61 per cent as to cost. The fourth table is the record of 19 trials in summer, and shows a consumption of 32·08 pounds per train-mile. Other tables give the consumption for each month in the year. In conclusion, the author said that, although it was scarcely possible that petroleum firing would ever be of use for locomotives in England on ordinary railroads, yet its employment on underground lines would be an enormous boon.

BLASTING EXPLOSIVES.*

By James Walker.

The object of these notes is to draw attention to some of the less recognized but important characteristics of explosives, the general features of which we are familiar with.

The act of 1875 specifies twenty-nine different explosives under the heads of nitrate mixtures, nitro compounds, and chlorate mixtures, besides fulminates, ammunition, and fire-works. Experience, however, has shown that only the two first-named classes are of any practical value for blasting purposes, and these in the forms of gunpowder, dynamite, and cotton powder or tonite.

There can be little doubt that, for the great majority of industrial operations, we have had no explosives likely to supersede gunpowder, not merely because of its comparatively low cost, but on account of its intrinsic qualities. One of the most important of these, however, is somewhat overlooked, at least in mining operations; namely, the extent to which its action can be modified by altering the size or form of the grains or pellets, and by utilizing the detonating principle. This property of gunpowder is rarely taken advantage of, the universal grain known as Fo being too indiscriminately used for all purposes.

The total explosive force of the different blasting-powders varies very little, there being but one nominal quality made for use in this country; but the effectiveness for different purposes is greatly influenced by the form in which the powder is used. The actual force is that exerted by the increase of volume consequent on the conversion of the solid substance into its gaseous state when fired, and the further expansion caused by the heat generated in the action.

The effect, however, is controlled by the rapidity with which the evolution of the gases takes place, and may be said to vary *directly* as the volume and *inversely* as the time occupied by the evolution. This can be regulated with considerable nicety and within wide limits in the manner indicated above without altering the component parts of the explosive. The following experiments made at the Royal Works at Waltham Abbey will illustrate this: A portion of the press-cake, that is, the cake as it leaves the presses before being broken up by the granulating-machine, was placed in one piece in a mortar with a light ball. When fired, the ball did not leave the mortar. A similar portion broken into twelve or fifteen pieces threw the ball three yards; again, breaking the same quantity into fifty pieces, the ball was projected ten yards; and when the same weight of ordinary grain powder was used, the range given was fifty-seven yards. The rate of combustion was so slow in the first instance that the gases escaped round the ball and through the vent-holes as fast as they were evolved. By quickening the evolution, they could not so escape, and forced out the ball at a greater or less rate of speed, the total force exerted being the same, however, in each case. Though this illustrates the effect the form of the powder has upon its action, it must be remembered that in the above experiments the charge was practically unconfined, and such a wide variation would not be found with a heavy and closely fitting ball, or when the shot is firmly stemmed, as in blasting.

The shape of the grains also enters largely into the calculation of effect, as thin flat grains will explode more rapidly than cubes or spheres of the same weight in proportion as they expose a greater surface to be acted upon. We have further, however, to bear in mind that, when the grains are large and round, the interstices in the charge are larger than with a smaller or flat-shaped grain, and the ignition of the whole charge will thus be facilitated, and to a certain extent counteract the retarded combustion. These considerations more particularly affect the manufacture of military and sporting powders, where the required action for each size or kind of gun or projectile can be determined with precision before being finally adopted. Even in blasting, however, where there is necessarily some uncertainty as to the nature of the resistance to be overcome, it is of value to the miner to know that either a local and shattering effect or a more widely spread and progressive action can be obtained by different forms of the ordinary quality of blasting-powder.

The most recent addition to these is the compressed cartridge, made by pressing the granular or loose powder by hydraulic power in cylindrical molds fitted with an arm to retain a hole through the center of the

* Transactions of Mining Institute of Scotland.

cartridge, in which to insert the fuse. The specific gravity of a charge of ordinary blasting-powder is as near as possible 1·0, but after compression it is as high as 1·50, and as the power varies as the increase of volume when fired, it will be seen that the molded cartridges have 50 per cent more explosive force than loose powder, and of a more gradual and progressive nature when fired in the ordinary way, but, when properly detonated, giving results nearly equal to those of dynamite. The French chemists, MM. Roux and Sarrau, have stated the effect of detonation in various explosions as follows:

	Exploded.	Detonated.
Gunpowder	1·00	4·34
Gun cotton	3·00	6·46
Nitro-glycerine	4·80	10·13

If we take compressed powder, as giving from its high density 50 per cent better results than when loose, we get 6·51 as the relative value of the cartridge when detonated. Dynamite containing 75 per cent of nitro-glycerine would give 7·59; a comparison which shows an available power in the cheaper explosive not usually taken advantage of. In the loose state, it is not desirable to attempt the detonation of gunpowder, as it would be dangerous to subject the charge to concussion or compression in tamping; but the rigidity of the solid cartridge, with a center hole for the detonator, obviates that difficulty, and permits of the shot being easily and safely stemmed. In any case, detonation would not enhance the effect of loose powder in the same degree, as the charge would yield to a certain extent, and would not offer the resistance necessary to produce complete detonation. The smaller bulk of the compressed cartridges enables a saving of boring to be effected; and being of a given weight, the size of the charge can be regulated more precisely than with loose powder, when the hole frequently proves to have contained considerably more or less than was intended, involving a loss either way.

The question of the comparative safety of loose and compressed powder is, I think, easily decided in favor of the latter. In filling flasks, loading straws, and charging holes, powder is much exposed to ignition, especially in underground workings where lights are necessary; and in these operations, some of it is usually spilled and liable to be lit by a spark from the foot or a blow of any kind. It may also be taken up with *débris* from the floor of the mine for tamping, and as some portion of the charge often adheres to the side of the bore-hole when being put in, the result may be a considerable admixture of powder with the stemming. If violently struck with the stemming-rod, an explosion would take place; and probably some of the accidents that have occurred when preparing shots are traceable to this cause. It is further possible that when firing with squibs a little powder in the stemming being ignited, would blow a portion of it out, and the shot be partially or entirely lost. The ordinary loose powder also contains more or less dust, sometimes to a large extent, and, when handled, this dust rises and is carried away on any current of air, seriously enhancing the danger from explosive gases in underground workings.

It is obvious that none of these dangers can exist with the compressed cartridges. They are in paper covers, which need not be removed when they are used; and a spark accidentally coming into contact with them would harmlessly glance off. The pressing costs about 1d. a pound, and the sizes usually made are:

1⅛ inches diameter	9 to the pound
1¼ " "	8 " "
1⅜ " "	6 " "
1¾ " "	4 " "

Loose powder has the advantage of accommodating itself to any size of bore-hole, but that is a matter so easily adjusted by selecting the proper size of drill or cartridge that it is hardly an objection to the use of the latter. The cartridges are much less susceptible to damp, and can be used in a hole that would wet a considerable portion of the loose powder before it could be fired.

With the more advanced explosives, the difficulty hitherto has been to so bring them under control that they may be made available with the same degree of uniformity as gunpowder, and with equal safety in transport and handling. Nitro-glycerine, which has been tried in this country in the three forms of pure nitro-glycerine, blasting gelatine, and dynamite, is practically admitted to be suitable for blasting purposes only in the latter shape. Nitro-glycerine was by act of Parliament withdrawn as an article of commerce in 1869, its use having been attended by such serious and apparently unavoidable accidents as to render that step advisable for the public safety; and blasting gelatine, for similar reasons, has had such restrictions put upon its manufacture as will hinder its reintroduction as a blasting agent, unless the defects hitherto noticeable can be remedied. Its actual explosive force is perhaps greater than dynamite, but it is only available for certain purposes, and when strongly confined. Its action is not so violent as dynamite, and where a shattering effect is desired, or when the charge can not be closely confined and firmly stemmed, the latter is the most effective. Gelatine possesses the power of resisting for practically an unlimited time the action of water, which in a few hours would cause dynamite to part with its nitro-glycerine; but it is only in exceptional cases that any thing approaching that length of time has to elapse before firing a shot, so that the point is not material.

The laws that govern the action of nitro-glycerine compounds seem not yet to be thoroughly known; and this evil, which has all along militated against the uses of these explosives, would appear to be most pronounced in the case of gelatine. As is well known, they all freeze at a high temperature, and in that condition require very careful handling; but, while we find that the freezing-point of dynamite can be determined as about from 43 to 40 degrees Fahr., there is no rule applicable to gelatine, which at one time will freeze at 43 degrees Fahr., and at another will resist the cold throughout the severest winter night; and cartridges, showing this diversity, have been found in the same packages. Gelatine has shown the further peculiarity of being much more sensitive to concussion when frozen than when soft, in this respect reversing previous experience of such explosives; as nitro-glycerine and dynamite, when frozen, are difficult to explode, and may be struck with considerable violence. In some countries, nitro-glycerine is artificially frozen to lessen the danger of transport, though it is questionable if any advantage in this is not neutralized by the critical nature of the consequent thawing process, at which point so many accidents have occurred.

The chief obstacle, however, in the way of reintroducing blasting gelatine is the important fact that its safety and efficiency can not be coextensively secured, the increase of one being only attainable, so far as we have yet seen, at the expense of the other. To be safely kept and handled, it must be made of such consistency that it is liable only to partially explode when fired, the remaining unexploded portion being an obvious source of danger. This was shown by an accident at the operations carried on by the Clyde Trustees at Elderslie Rock, where a man working on one of the punts loaded with the rock that had been dredged up after blasting with gelatine was seriously injured by the explosion of a portion of the charge which had adhered to the stone and retained its explosive powers after being some weeks in the water. More complete explosion can be obtained by reducing the proportion of nitro-cellulose; but this, unfortunately, brings it under the minimum quantity necessary to effectively counteract the inherent dangers of the nitro-glycerine, and a large margin of safety should be required in endeavoring to demonstrate the fitness of such explosives for every-day use, as theories based on isolated and sometimes repeated experiments have been shown in practice to be not absolutely reliable.

Dynamite containing 75 per cent of nitro-glycerine gives a more satisfactory combination of efficiency and safety, but that proportion is not always to be relied on as present in the mixture. The absorption of 75 pounds of nitro-glycerine in 25 pounds of kiesselguhr is not of itself sufficient to constitute good dynamite, as, unless great care is taken to have the mixture perfectly uniform throughout the entire mass, so that each cartridge and part of a cartridge is composed of these proportions, the result is not satisfactory. Irregularity in this not only destroys calculations as to the size of charge required in blasting, but in the cartridges with more than 75 per cent of nitro-glycerine there is likely to be exudation of the liquid, especially under changes of temperature, and this is what is most to be guarded against.

An explosive not so much used in mining here as in England, where it is now largely employed, is the compressed nitro-cotton known as tonite, made by the Cotton Powder Company, at Faversham in Kent. When the explosive properties of gun-cotton were demonstrated by Schönbein, in 1846, it was thought that a valuable blasting agent had been discovered; but subsequent trials, under varying conditions, showed that, though very powerful, it was too sensitive to accidental disruption for ordinary use, while the carbonic oxide gas produced on explosion was a further obstacle to its adoption in mining. The property of retaining its powers when wet enabled it to be kept in this way with greater safety, and as it is not affected by change of temperature like the nitro-glycerine compounds, it has been adopted in preference to the latter for naval and military purposes. It was found, however, that not only could the strength of gun-cotton be increased, but its liability to accidental explosion and to yield the dangerous gases complained of could be obviated by the process now adopted at Faversham. The cotton fiber, after being treated with strong nitric and sulphuric acids, the action of which substitutes nitric peroxide for a portion of the hydrogen in the original substance and converts it into a powerful explosive, is then reduced to a fine pulp, with the double object of getting a greater density and of enabling the cotton to be more thoroughly washed, and all traces removed of the free acids and other nitro compound impurities that constitute the chief cause of spontaneous combustion. When perfectly cleaned, the nitro-cotton is then mixed with nitrate of baryta, which increases its power and stability, and at the same time counteracts its tendency to give off the dangerous carbonic oxide gas by supplementing the oxygen in the nitro-cotton, which otherwise would be insufficient for the complete combustion of the carbon. Several substances, such as the nitrates of soda, ammonia, etc., were tried for this purpose, but ultimately abandoned. Chlorate of potash makes the most powerful explosive, but is too sensitive, and dangerous when roughly handled. Nitrate of soda, which is used in the manufacture of an explosive known as potentite, was rejected as being readily soluble in water, the compound being liable to decomposition, while it is also of greater bulk. An inquiry at Liverpool last year into the cause of a fatal explosion of nitro-cotton, mixed with nitrate of soda, showed it to be its inability to withstand the pressure applied to the cartridges with the view of reducing their bulk.

The best combination of high density, stability, and absence of noxious fumes when fired, has been found to be obtainable by using nitrate of baryta. The tonite, when mixed with this, is then molded into cartridges of various sizes under a pressure of several tons to the square inch, which gives it a specific gravity of 1·50. The pure compressed gun-cotton used for military purposes has a specific gravity of 1·003, and dynamite about 1·60. It is this density and the properties of the nitrate of baryta that give tonite its power and stability, the latter being shown by the force required to detonate it. A dynamite detonator containing 7 grains of fulminate of mercury (which is considerably more than is absolutely necessary) will not explode tonite; and detonators of special composition, and equal to about 13 grains of fulminate of mercury, are made for the purpose. When lit, it quietly burns, and a sufficient intensity of heat to explode it can not be obtained in this way, as is often the case with the nitro-glycerine explosives. The mode of firing is important, as the full value of these nitro-compounds is often lost through ignorance of the principle of detonation, which may be called a practically instantaneous upsetting of the equilibrium of the combined oxygen and nitrogen, and producing the extremely rapid combustion following upon the union of the former with the carbon contained in the explosive substance; and it is erroneous to suppose that any shock of a given violence will effect this. Professor Bloxam has defined detonation as a kind of sympathetic vibration, and caused as much by the *quality* as by the *force* of the initial explosion. Thus, a few grains of fulminate of mercury will detonate compressed gun-cotton, while nitro-glycerine, though much more powerful than the fulminate, will not do so unless used in much larger quantities. I have frequently seen dynamite exploded by putting loose gunpowder into the hole and firing it with a straw, but the result in those cases is not equal to that of a properly detonated charge. Tonite can not be fired in this way, and as much as 3 ounces of dynamite detonated in contact with it have failed to do more than disperse the tonite. It is not affected by temperature, and is therefore at all times ready for use. Its behavior

under given circumstances is not erratic like that of some explosives, and this, coupled with its freedom from accidental explosion, is relied on by the railroad companies in agreeing to carry it upon the same terms as gunpowder.

In endeavoring to ascertain the comparative strength of advanced explosives, the modes of testing applied to gunpowder, such as the mortar and pistol test—the latter a most unreliable one at all times—are not of any value, the violence of the explosion being such that the force is exerted upon the material of the instrument almost instantaneously and before any registering mechanism can be brought into play. It is only by an extended series of experiments in which a careful estimate of the work to be done has been made that any reliable data can be got to found conclusions upon, and the tables of results sometimes given by special modes of testing may be found in practice to be altogether misleading. My experience of tonite and dynamite shows them to be of about equal strength when properly fired. Sometimes better results are got by the latter; but inquiry would probably show it to be owing to the fact that, while the dynamite, from its plastic nature, closely fitted the bore-hole, the tonite, on the other hand, being rigid, would have an air-space around the cartridge, which, of course, very materially affects the result when we remember that the effect upon an object not in contact with the explosive is inversely as the square of the distance. I have referred to this point in connection with loose and compressed gunpowder. Where tonite is regularly used, there is no such difficulty, the proper size of drill or cartridge being determined at first and adhered to; but where there is any discrepancy, water can be used to fill any space there may be around the cartridge, and so utilize its full power. In many cases, nothing else is used; but all explosives should be stemmed if possible with something more holding, or a portion of the power will be lost.

THE CONSUMPTION OF COAL IN GREAT BRITAIN.

Mr. I. Lowthian Bell, the well-known iron-master, in the course of an able presidential address before the British Institution of Mechanical Engineers at Cardiff, desired to call attention to the enormous extent of ground covered directly and indirectly by the work of the Mechanical Engineers in Great Britain. No estimate of this kind, he says, can pretend to be more than the roughest approximation; and perhaps the quantity of coal burnt in various processes and manufactures may serve as well as any other measure for the object in question.

About twenty years ago, an attempt was made in a government inquiry to assign to the various sources of consumption their proportion of the coal raised. In the first column of figures in the annexed table, these proportions are set against each branch of trade. The second column has these numbers applied to the coal wrought in 1882, being the last return issued by Her Majesty's Inspector of Mines. The quantities thus obtained are then divided in a somewhat arbitrary way. In some of the items, such as railroads, the whole quantity may be set down as being employed for mechanical power; while in some of the others, the coal is used partly for the development of power and partly for processes in which heat is required as an agent. Such an example is found in the coal consumed in textile industries; but even here it is no exaggeration to say that, but for the spinning and weaving machinery, in fact, but for the works of the mechanical engineer, the manufacture of textile fabrics, as well as many others, would have occupied a very insignificant position in the industries of the world. Mr. Bell has, however, in the rough way already intimated, divided the whole quantity of coal raised under two columns headed M and H (mechanical and heating); the one, headed H, containing the quantities more or less independent of any influence exercised by the use of machinery; and the other, headed M, those affecting, directly or indirectly, the use of mechanical appliances. Iron and steel making is here considered as directly influenced by the use of machinery.

TABLE SHOWING THE PURPOSES TO WHICH THE COAL RAISED IN GREAT BRITAIN IN THE YEAR 1882 WAS APPLIED.

Heads of Consumption.	Out of 1000 tons raised there were used in	Total coal worked, and used as below.	Rate of division. m.	Rate of division. h.	M.	H.
		Tons.			Tons.	Tons.
Paper making and tanning	6	939,000	·5	·5	469,500	469,500
Smelting copper, lead, tin, and zinc	8	1,252,000	·1	·9	125,200	1,126,800
Water-works	14	2,191,000	1	..	2,191,000	.....
Breweries and distilleries	18	2,817,000	·1	·9	281,700	2,535,300
Chemical manufactories	19	2,973,000	·1	·9	297,300	2,675,700
Railroads	20	3,130,000	1	..	3,130,000	.....
Steam navigation	30	4,695,000	1	..	4,695,000	.....
Clay, glass, and lime-kilns	31	4,851,500	·1	·9	485,150	4,366,350
Textile fabrics	42	6,573,000	·6	·4	3,943,800	2,629,200
Gas-works	60	9,390,000	..	1	.....	9,390,000
Mining operations	67	10,485,500	1	..	10,485,500	.....
Coal exported	92	14,398,000	·5	·5	7,199,000	7,199,000
Steam-engines	121	18,936,000	1	.	18,936,000	.....
Domestic use	172	26,918,000		1	.....	26,918,000
Iron and steel-works	300	46,950,000	1	..	46,950,000	.....
	1000	156,499,000			99,189,100	57,309,800

By this mode of computation, it would appear that there is consumed for mechanical purposes, or for industries that are wholly dependent on machinery, about 63 per cent of all the coal raised in Great Britain. The account is no doubt susceptible of considerable modifications in either direction; but one fact will remain undisputed, namely, that a very large proportion of the fuel is applied for purposes directly connected with the profession of the mechanical engineer.

THE FRANCKE "TINA" OR VAT PROCESS FOR THE AMALGAMATION OF SILVER ORES.*

By Edgar P. Rathbone, London.

In the year 1882, while on a visit to some of the great silver mines in Bolivia, an opportunity was afforded the writer of inspecting a new and successful process for the treatment of silver ores, the invention of Herr Francke, a German gentleman long resident in Bolivia, whose acquaintance the writer had also the pleasure of making. After many years of tedious working, devoted to experiments bearing on the metallurgical treatment of rich but refractory silver ores, the inventor has successfully introduced the process of which it is proposed in this paper to give a description, and which has, by its satisfactory working, entirely eclipsed all other plans hitherto tried in Bolivia, Peru, and Chili. The Francke "tina" process is based on the same metallurgical principles as the system described by Alonzo Barba, in 1640, and also on those introduced into the States in more recent times under the name of the Washoe process.† It was only after a long and careful study of these two processes, and by making close observations and other experiments on other plans that had up to that time been tried with more or less success in Bolivia, Peru, and Chili, such as the Mexican amalgamation process—technically known as the "patio" process—the improved Freiberg barrel amalgamation process, as used at Copiapo, and the "Kroehncke" process—that Herr Francke eventually succeeded in devising his new process, and by its means treating economically the rich but refractory silver ores, such as those found at the celebrated Huanchaca and Guadalupe mines in Potosi, Bolivia. In this description of the process, the writer will endeavor to enter into every possible detail having a practical bearing on the final results, and with this view he begins with the actual separation of the ores at the mines.

Ore-Dressing, etc.—This consists simply in the separation, by hand, at the mines, of the ore into different qualities, women and boys with small hammers being employed—the "cobbing" process of Cornwall. The object of this separation is twofold—first, to separate the rich parts from the poor as they come together in the same lump of ore; otherwise, rich pieces might go undetected; and secondly, to reduce the whole body of ore coming from the mine to such convenient size as permits of its being fed directly into the stamps battery. The reason for this separation not being effected by those mechanical appliances so common in most ore-dressing establishments, such as stone-breakers or crushing-rolls, is simply because the ores are so rich in silver, and frequently of such a brittle nature, that any undue pulverization would certainly result in a great loss of silver, as a large amount would be carried away in the form of fine dust. So much attention is indeed required in this department that it is found requisite to institute strict superintendence in the sorting or cobbing-sheds, in order to prevent as far as practicable any improper diminution of the ores. According to the above method, the ores coming from the mines are classified into the four following divisions:

I. Very rich ore, averaging about 6 per cent of silver, or containing, say, 2000 ounces of silver to the ton (of 2000 pounds).

II. Rich ore, averaging about 1 per cent of silver, or say from 300 to 400 ounces of silver to the ton.

III. Ordinary ore, averaging about ½ per cent of silver, or say from 150 to 200 ounces of silver to the ton.

IV. Gangue or waste rock, thrown on the dump-heaps.

The first of these qualities—the very rich ore—is so valuable as to render advantageous its direct export in the raw state to the coast for shipment to Europe. The cost of fuel in Bolivia forms so considerable a charge in smelting operations that the cost of freight to Europe on very rich silver ores works out at a relatively insignificant figure when compared with the cost of smelting operations in that country. The rich ore is consequently selected very carefully and packed up in tough raw hide bags, so as to make small compact parcels from 18 inches to two feet long, and from 8 to 12 inches thick, each containing about one cwt. Two of such bags form a mule load, slung across the animal's back. The second and third qualities of ore are taken directly to the smelting-works; and where these are situated at some distance from the mines, as at Huanchaca and Guadalupe, the transport is effected by means of strong but lightly-built iron carts, specially constructed to meet the heavy wear and tear consequent upon the rough mountain roads. These two classes of ores are either treated separately, or mixed together in such proportion as is found by experience to be most suitable for the smelting process. On its arrival at the reduction-works, the ore is taken directly to the stamp-mill. At the Huanchaca works, there are sixty-five heads of stamps, each head weighing about 500 pounds, with five heads in each battery and crushing about 50 cwt. per head per twenty-four hours. The ore is stamped dry, without water, requiring no coffers: this is a decided advantage as regards first cost, owing to the great weight of the coffers, from two to three tons—a very heavy item when the cost of transport from Europe at about £50 per ton is considered. As fast as the ore is stamped, it is shoveled out by hand, and thrown upon inclined sieves of forty holes per lineal inch: the stuff that will not pass through the mesh is returned to the stamps. Dry stamping may be said to be almost a necessity in dealing with these rich silver ores, as, with the employment of water, there is a great loss of silver, owing to the finer particles being carried away in suspension, and thus getting mixed with the slimes, from which it is exceedingly difficult to recover them, especially in those remote regions, where the cost of maintaining large ore-dressing establishments is very heavy. Dry stamping, however, presents many serious drawbacks, some of which could probably be eliminated if they received proper attention. For instance, the very fine dust, which rises in a dense cloud during the operation of stamping, not only settles down on all parts of the machinery, interfering with its proper working, so that some part of the battery is nearly always stopped for repairs, but is also the cause of serious inconvenience to the workmen. At the Huanchaca mines, owing to the presence of galena or sulphide of lead in the ores, this fine dust is of so injurious a character as not unfrequently to cause the death of the workmen; as a precautionary measure, they are accustomed to stuff cotton-wool into their

* Read at the Cardiff Meeting of the British Institution of Mechanical Engineers.
† Transactions of the American Institute of Mining Engineers, vol. ii., p. 159.

nostrils. This, however, is only a partial preventive, and the men find the best method of overcoming the evil effect is to return to their homes at intervals of a few weeks, their places being taken by others for the same periods. In dry stamping, there is also a considerable loss of silver in the fine particles of rich ore that are carried away as dust and irrevocably lost. To prevent this loss, the writer proposed, while at Huanchaca, that a chamber should be constructed, into which all the fine dust might be exhausted or blown by a powerful fan or ventilator.

Roasting.—From the stamps the stamped ore is taken in small ore-cars to the roasting-furnaces, which are double-bedded in design, one hearth being built immediately above the other. This type of furnace has proved, after various trials, to be that best suited for the treatment of the Bolivian silver ores, and is stated to have been found the most economical as regards consumption of fuel, and to give the least trouble in labor. At the Huanchaca mines, these furnaces cost about £100 each, and are capable of roasting from 2 to 2½ tons of ore in twenty-four hours, the quantity and cost of the fuel consumed being as follows:

	Bolivian dollars at 3s. 1d.
Tolo (a kind of shrub) 3 cwt. at 60 cents	1.80
Yareta (a resinous moss), 4 cwt. at 80 cents	3.20
Torba (turf), 10 cwt. at 40 cents	4.00
Bolivian dollars	9·00 say 28s.

One man can attend to two furnaces, and earns 3s. per shift of twelve hours. Probably no revolving mechanical furnace is suited to the roasting of these ores, as the operation requires to be carefully and intelligently watched; for it is essential to the success of the Francke process that the ores should not be completely or "dead" roasted, inasmuch as certain salts prejudicial to the ultimate proper working of the process are liable to be formed if the roasting be too protracted. These salts are mainly due to the presence of antimony, zinc, lead, and arsenic, all of which are unfavorable to amalgamation. The ores are roasted with 8 per cent of salt, or 400 pounds of salt for the charge of 2½ tons of ore; the salt costs 70 cents. or 2s. 2d., per 100 pounds. So roasted, the ores are only partially chlorinized, and their complete chlorinization is effected subsequently, during the process of amalgamation; the chlorides are thus formed progressively as required, and, in fact, it would almost appear that the success of the process virtually consists in obviating the formation of injurious salts. All the sulphide ores in Bolivia contain sufficient copper to form the quantity of cuprous chloride requisite for the first stages of roasting. in order to render the silver contained in the ore thoroughly amenable to subsequent amalgamation.

Amalgamating.—From the furnaces, the roasted ore is taken in ore-cars to large hoppers or bins situated immediately behind the grinding and amalgamating vats, locally known as "tinas," into which the ore is run from the bin through a shoot fitted with a regulating slide. The tinas or amalgamating vats constitute the prominent feature of the Francke process. They are large wooden vats, from 6 to 10 feet diameter and 5 feet deep, capacious enough to treat about 2½ tons of ore at a time. Each vat is very strongly constructed, being bound with thick iron hoops. At the bottom, it is fitted with copper plates about 3 inches thick; and at intervals around the sides of the vat are fixed copper plates, with ribs on their inner faces, slightly inclined to the horizontal for promoting a more thorough mixing. It is considered essential to the success of the process that the bottom plates should present a clear rubbing surface of at least 10 square feet. Within the vat and working on the top of the copper plates there is a heavy copper stirrer or muller caused to revolve by shafting at the rate of 45 revolutions per minute. At Huanchaca, this stirrer has been made with four projecting radial arms; but at Guadalupe, it is composed of one single bell-shaped piece without any arms, but with slabs like arms fixed on its under side; and this latter is claimed to be the most effective. The stirrer can be lifted or depressed in the vat at will by means of a worm and screw at the top of the driving-shaft. The bevel gearing is revolved by shafting connected with pulley-wheels and belting, the wheels being 3 feet and 1½ foot diameter and 6 inches broad. The driving-engine is placed at one end of the building. Each vat requires from 2½ to 3 horse-power, or, in other words, an expenditure of one horse-power per ton of ore treated. At the bottom of the vat and in front of it, a large wooden stop-cock is fitted, through which the liquid amalgam is drawn off at the end of the process into another shallow-bottomed and smaller vat. Directly above this last vat, there is a water hose supplied with a flexible spout, through which a strong stream of water is directed upon the amalgam as it issues from the grinding-vat, in order to wash off all impurities.

The following is the mode of working usually employed: The grinding-vat or tina is first charged to about one fifth of its depth with water and from 6 to 7 cwt. of common salt. The amount of salt required in the process depends naturally on the character of the ore to be treated, as ascertained by actual experiment, and averages from 150 to 300 pounds per ton of ore. Into this brine, a jet of steam is then directed, and the stirrer is set to work for about half an hour, until the liquid is in a thoroughly boiling condition, in which state it must be kept until the end of the process. As soon as the liquid reaches boiling-point, the stamped and roasted ore is run into the vat, and at the end of another half-hour about one cwt. of mercury is added, further quantities being added as required at different stages of the process. The stirring is kept up continuously for from eight to twelve hours, according to the character and richness of the ore. At the end of this time, the amalgam is run out through the stop-cock at the bottom of the vat, is washed, and is put into hydraulic presses, by means of which the mercury is squeezed out, leaving behind a thick, pulpy mass, composed mainly of silver, and locally termed a "piña," from its resembling in shape the cone of a pine-tree. These "piñas" are then carefully weighed and put into a subliming-furnace, in order to drive off the rest of the mercury, the silver being subsequently run into bars. About four ounces of mercury are lost for every pound of silver made. The actual quantities of mercury to be added in the grinding-vat, and the times of its addition, are based entirely on practical experience of the process. With ore assaying from 150 to 175 ounces of silver to the ton, 75 pounds of mercury are put in at the commencement, another 75 pounds at intervals during the middle of the process, and finally another lot of 75 pounds shortly before the termination. When treating "pacos" or earthy chlorides of silver, assaying only from 20 to 30 ounces of silver to the ton, 36 pounds of mercury are added to 2½ tons of ore at three different stages of the process as just described. The rationale of the process therefore appears to be, that the chlorinization of the ores is only partially effected during the roasting, so as to prevent the formation of injurious salts, and is completed in the vats, in which the chloride of copper is formed progressively as required, by the gradual grinding away of the copper by friction between the bottom copper plates and the stirrer; and this chloride, subsequently becoming incorporated with the boiling brine, is considered to quicken the action of the mercury upon the silver.

Retorting.—The retorting-furnace is a plain cylindrical chamber, about 4 feet diameter inside and 4½ feet high, lined with fire-brick, in the center of which is fixed an upright cast-iron cylinder or retort of one foot diameter, closed at top and open at bottom. The furnace top is closed by a cast-iron lid, which is lifted off for charging the fuel. Round the top of the furnace, is a tier of radial outlet holes for the fuel smoke to escape through; and around the bottom is a corresponding tier of inlet air-holes, through which the fuel is continually rabbled with poles by hand. The fuel used is llama dung, costing 80 cents or 2s. 6d. per 250 pounds; it makes a very excellent fuel for smelting purposes, smoldering and maintaining steadily the low heat required for retorting the mercury from the amalgam. Beneath the furnace is a vault containing a wrought-iron water-tank, into which the open mouth of the retort projects downward, and is submerged below the water. For charging the retort, the water-tank is placed on a trolly; and standing upright on a stool inside the tank, is placed the piña, or conical mass of silver amalgam, which is held together by being built up on a core-bar fitted with a series of horizontal disks. The trolly is then run into the vault, and the water-tank containing the piña is lifted by screw-jacks, so as to raise the piña into the retort, in which position the tank is then supported by a cross-beam. The retorted mercury is condensed and collected into the water; and on the completion of the process, the tank is lowered, and the spongy or porous cone of silver is withdrawn from the retort. The retorting-furnaces are ranged in a row, and communicate by lines of rails with the weigh-house.

THE APPLICATION OF THE LOISEAU COMPRESSING MACHINE TO THE MANUFACTURE OF CEMENT.

Mr. E. F. Loiseau, of Philadelphia, describes, in a paper read before the Engineers' Club of that city, a recent application of his machine, used hitherto for making artificial fuel, as follows:

After the destruction of the works of the Loiseau Fuel Company by fire, in March, 1883, Messrs. Lesley & Trinkle, of Philadelphia, purchased the mixer, the press, and other parts of the machinery, from the Philadelphia & Reading Railroad Company. The different machines were carefully repaired and were re-erected at the cement-works, corner of Fairmount and Delaware avenues, Philadelphia. Messrs. Lesley & Trinkle having made with me satisfactory arrangements, I agreed to assist them in testing, on a large scale, Professor de Smedt's process as well as the process of Messrs. Willcox & Lesley. We mixed the ground rock with crude coal-tar, adding a small quantity of water to form the paste, and this molded well enough; but nothing but half eggs could be obtained. The coal-tar by itself had not sufficient binding power to form a solid egg, and each molding-roller would carry off a half egg. I had devised a new feeding-piece for the press, and the materials were delivered very regularly between the two molding-rollers, therefore I was satisfied that the trouble did not originate with the compressing machine, but could only be attributed to the condition of the materials when mixed. The mixture was plastic, and in order to render it coarser, I added to it a certain percentage of coke-dust, which I thought would bind more firmly together the almost impalpable cement rock, and destroy its plasticity when mixed with the coal-tar and water. The result was very gratifying, and from that time the lumps left the molds in their entirety. The calcination of the lumps, conveyed directly from the press to the kiln without previous drying, was very successful, and demonstrated conclusively that Professor de Smedt's theory was correct. The egg-shaped form of the lumps facilitated the calcination and distributed the heat more evenly. It also required less time and a smaller quantity of fuel than by the old processes. No improvements have been made in the manufacture of hydraulic cements for a number of years; but the improved methods of Professor de Smedt and Messrs. Lesley and Willcox have given such important results that they will no doubt create a radical change in that branch of industry. These experiments have, moreover, demonstrated that, with my machinery, any kind of pulverized, granulated, or gritty material can be solidified in egg-shaped form, which is the most convenient for handling, and which leaves always between the lumps sufficient space for the free circulation of air or heat, and, consequently, for a free combustion.

Through the courtesy of Messrs. Lesley & Trinkle, I was also enabled to experiment with granulated magnetite ore from the Phœnix Iron Company's "Hazy Vein," at Boyertown, Berks County. This fine ore can not be roasted. and but a small proportion of it is used raw in the furnace. It contains from 1 to 1½ per cent of sulphur, as I am informed by Mr. John H. Harden, General Mining Engineer of the Phœnix Company. The result of solidified shapes of the fine ore would enable it to be roasted, so that pig-iron made from it would contain a smaller percentage of sulphur than at present. It would also utilize all the fine ore mined. On examination, I found that the ore contained sufficient argillaceous matter, and I merely mixed some water with the ore as it had been sent to me. The success was complete. I submitted the lumps to several degrees of heat, and they stood the fire without breaking. The roasting was perfect. In some lumps, I brought the iron to the melting-point, as the members will see by the lumps that I submit. Those experiments were made, under blast, in a portable forge and while the lumps of ore were still wet. This last experiment demonstrates to a certainty that all the granulated ores can be solidified at very little expense (particularly those ores containing argillaceous matter), and that the metals which they contain can thus be secured.

SIGNALING BY ELECTRICITY.*

By Sydney F. Walker.

The writer having been for some years engaged in the application of electricity to mining purposes, and electric signals having now been so generally adopted in the operations of coal and iron mines, he has much pleasure in communicating the results of his experience to the Institute, feeling sure that the more electricity is brought under the notice of mining engineers and mine-owners, the more useful will it be found in mining operations, and the more extensively will it be adopted.

The principal advantages of electric signaling for mines are:

1. The signal is transmitted practically instantaneously.
2. Any number of knocks may be made in rapid succession.
3. Signals can be made to and from any number of places, all together, separately, or in any manner that may be desired.
4. The wires may be carried around curves, and in any direction, even in a tangle, without in the slightest degree affecting the efficiency of the signal.
5. The wires, once properly laid, need no repairs. There is no consumption of material except in the battery, and that, with proper insulation, is very small indeed.
6. They are easily kept in repair, far more easily than hand rappers.
7. Telephones can be worked in connection with them. This is an enormous advantage.

But it must be remembered that where one can not afford telephones, one may afford an electric signal.

The following electric signals are the only forms for which the writer has, up to the present, found any opening in mines; but they by no means express the limits of the applicability of electricity for this purpose:

The most useful signal, and the one of which the greatest number is in use in collieries and iron mines, is the engine plane signal. This consists of an electric bell and battery, which are placed in the engine-house, and two wires that extend from the engine-house to the end of the plane, and are connected with the bell and battery. For collieries, these wires are of naked galvanized iron. Where the engine is on the surface, two wires are carried from the engine-house down the shaft, and are then connected with the wires on the engine plane. One of the wires in the shaft is of copper, covered with gutta-percha. In both cases, the signal is given by making connection between the naked iron wires at any part of the plane.

The single-stroke bell is the one most frequently used in mines; sometimes, however, a trembling or vibrating bell is preferred. If required to signal to the end of the plane at the same time as to the engine-man, the same battery and the same wires may be used to ring a second bell at that end. In this case, the connection between one of the wires on the engine plane and one side of the bell is broken. The engine plane wire is left disconnected. The bell on that side is now connected either to "earth," as the rails, the engine, etc., or to a third wire, fixed for the purpose, extending to the end of the plane. This third wire, in this case, need not be insulated; it may be stapled out of the way. At the other end of the engine plane, a second bell is connected between the wire that has just been disconnected from the bell in the engine-house, and "earth," or the third wire. When connection is made between the first two wires, the electric current passes from the battery through both bells, returning either by "earth" or the third wire. The third wire is necessary, where the mine is very dry, or it is difficult to maintain good "earth" at the end of the plane.

It may be required to have a number of bells in different parts of the plane, all of which shall ring together, as before, from anywhere. The arrangement for this signal is an extension of that of the one last described. One battery is used and three wires, all of which must be insulated. The third wire referred to before, which is now insulated, carries the current from the battery to all the bells. When connection is made between the other two wires, the current passes through all these bells, causing them to ring simultaneously. This might be used for Cornish mines, a bell at each level, all ringing together.

A description of the shaft signals that are used at collieries may be interesting. One bell similar to those used for the engine plane signals, is placed on the bank, another in the engine-house, and a third at the bottom. A battery is placed in the engine-house, and another battery at the pit bottom. One gutta-percha covered copper wire and one naked galvanized iron wire are fixed in the shaft, usually stapled at the side, and they are continued to the engine-house on the bank, either by means of iron wires stretched from the head-stocks to the engine-house, or by covered wires running under the bank. A ringing-key, that is, a mechanical contrivance for making contact between two wires, is placed at the bottom. When contact is made with this, the bell on the bank rings, or those on the bank and in the engine-house may be made to ring together. A similar ringing-key is placed on the bank, and sometimes one in the engine-house, both of which ring the bell at the pit bottom. A key is also often fixed on the bank to ring a bell in the engine-house. The battery in the engine-house works the down signals, and those from the bank to the engine. The up signals are worked by the battery at the pit bottom. The latter may be worked from the surface battery, by fixing an additional covered wire in the shaft to carry the current to the key at the bottom. In both these arrangements, a double contact key is used.

The following is the arrangement proposed for Cornish mines. One bell in the engine-house, one bell on the bank; one battery in the engine-house; *two* gutta-percha covered copper wires, laid from the engine-house to the bank and thence down the shaft, or two naked galvanized iron wires stretched from the bank to the engine-house, secured to earthenware terminal shackles, and gutta-percha covered wires laid from them down the shaft. The wires in the shaft may be stapled out of the way, to plugs, timber, or any thing, and anywhere where they will be secure from mechanical injury. A ringing-key at each level, to make connection between the two gutta-percha covered wires. When any key is pressed, the two bells on the bank will ring together. Any number of keys may be attached, without in any way affecting the efficiency of the signal. One gutta-percha covered wire and one iron wire will do, where the water in the shaft is such that the iron wire is not likely to be eaten through quickly. Where the shaft is quite dry and there is room, two naked galvanized iron wires secured to earthenware insulators may be used, as in engine planes in collieries. Should it be desired to signal down to each level, as well as up, it may be done by carrying a separate wire down for each and fixing bells there. The ringing-key for the single *up* signal for Cornish mines need only be a single contact key. The parts that come into contact must be always very clean, and there must be no path for the passage of the current from the battery contact to the others, when a signal is not being given. A loose wire or a damp board may form such a path. In the form of ringing-key adopted by the writer for shaft signals, a bent brass lever is used. It is held in its place by a strong German silver spiral spring, and it works vertically between two brass stops. These, the working parts, are inclosed in a strong iron box, made as nearly dust and damp-proof as possible. Terminal screws are left outside for the wires to be connected with. The lever is worked by a small brass pin that passes through the bottom of the box, and is itself worked by another lever, hinged on the outside. The front of the case can be removed at any time, in order to examine the working parts, without interfering with the working of the signal. Another form of ringing-key in use consists of a very stout sheet-brass spring, which, when forced down, makes contact with a small brass stop, and so closes the electric circuit. A double contact may be made with this, by using the brass bracket that keeps the spring from flying back. The whole, with terminal screws, is mounted on a wooden board, and covered with a wooden case.

In another form, a plunger is used, which either completes the circuit itself by coming into contact with a contact piece, or causes a spring to make contact between two pieces of brass or iron. In this case, also, the contacts are usually mounted on a wood base. There is always a danger in these forms of ringing-keys, especially at a shaft bottom, that the board may either hold moisture, or that it may condense on the surface of the wood. In either case, a path is formed for the escape of the current, which may be a serious drain on a battery at that station. The connections between the copper wires are also very liable to be eaten away by chemical action; and as they are hidden inside the apparatus, the cause is not immediately visible, and may not be discovered without some trouble.

Another very useful signal is the tapper or block signal. It is used principally for surface inclines and for short railroads, or for signaling wherever it is only required to signal from end to end. It is a most reliable and economical signal.

Telephones may be worked on any of the signals described, even if the telephone stations are a little distance from the signaling stations. The telephone does not affect the working of the signal, and is only brought into action on taking it off the hook.

In all these signals, the naked iron wire used is No. 8 or No. 11 galvanized iron telegraph wire. For underground work, No. 8 is to be preferred, as it makes a stronger and neater job; it offers less resistance to the passage of the electric current, and it is not so readily broken by falling stones. No. 11, however, has been fixed in a great many instances, and has been found to answer very well. Where it is important to reduce the amount of a contract, the iron wires form a fair subject for economy. The writer has used the ordinary strand wire in special cases, with very good results. The iron wires, except where they are used as "earth" or return wires, are securely bound to earthenware or porcelain insulators with finer galvanized iron wire. It is very important that the wires should be well bound in. In case of breakage, they ought not to run back more than two or three insulators. If loosely bound, they may run back the whole length of the road. It is also of very great importance that the naked insulated wires on the engine planes should touch nothing except the insulators. If a wire touches coal or wood, more especially if it be damp, a path is formed through which a very small portion of the current escapes. Wood or coal, whether wet or dry, is a very poor conductor of electricity; but if the wire touches in many places, the effect may be serious, because the current is leaking out at each of those places during the whole time the signal is connected. The number of insulators to be used will depend entirely on the nature of the road. They must be sufficiently near to keep the wires everywhere clear of each other and of every thing else, and to keep them fairly taut. Beyond this, there is no advantage in multiplying the number of insulators. The form of insulator is immaterial.

Staples have been used for fixing wires on underground engine planes, with small pieces of India rubber tubing or sheet, to insulate the wire from the prop and the staple. This may do in exceptional cases, such as very dry mines; but probably much better results, better signals, less trouble, and less consumption of material would be obtained even in those cases if insulators were used. The covered wire used by the writer for underground purposes is copper covered with gutta-percha. It is of great importance to have a good thickness of gutta-percha and a tolerably strong copper wire. No. 16 or No. 14 B. W. G. will do for the copper. The gutta-percha should never be less than No. 4 B. W. G., and as much thicker as possible. No. 16 copper, covered to No. 7, and then covered with tarred tape, has been used; but the tape is found to rot and get stripped off, and the wire is then very easily damaged. It is a very good plan to have the wires in a shaft, or any covered wires that are exposed, protected with some kind of wood boarding.

The bells that are used for signaling in mines should be made very strong. Mechanically, their parts should be so fitted that no change of temperature—nothing, in fact, but an extraordinary accident—should put them out of working order. There should also be a large reserve of power in the electro-magnet, so that the ordinary working of the mine should not affect the signaling; they should give a loud, clear signal. These requirements are obtained by having large bell domes, large electro-magnets, constructed with a long length of wire not too thin, and by having all the working parts mounted on a metallic base. They should, of course, be placed in strong cases.

The battery is the most important part of the whole apparatus. It furnishes the energy that is utilized in striking the bell. There is a great number of different forms of batteries, but the only three that have been used for electric signaling, so far as the writer is aware, are: The Daniell or sulphate of copper battery; the bichromate of potash, or

* From the Transactions of the Mining Institute of Cornwall.

the mercury-bichromate, as the form used is called; and the Leclanché or manganese sal-ammoniac battery. Daniell's battery is now very rarely used in mines. The bichromate is a new form that is also not yet much used. That which is almost universally adopted is the Leclanché. An important point is, to have the cells of the battery sufficiently large. If small cells are used, such as pint Leclanché, there is not sufficient active peroxide of manganese to stand a sudden or long-continued strain; consequently, the signal might fail. But by having the cells large, they may be, and have been, made to stand any work that they are ever called on to do in any mine. To have powerful electro-magnets in the bells, and large cells, is the secret of success in electric signaling in mines.

There is, in the writer's opinion, no mine where electricity may not be successfully applied to signaling; but there are some in which difficulties occur, such as the roads being very wet, or there being so much moisture that it is difficult to get good insulation. In these cases, the course to be adopted is to get the insulation as perfect as possible, using covered wire if necessary, and large battery cells.

In a case in which the writer was consulted, it was required to ring six bells at different parts of the plane from one battery in the engine-house, the length of the road being 1300 yards; 36 pint Leclanché cells that were in use, but which would not keep up for more than a week at a time, the insulation being very faulty, were removed, and replaced by 26 gallon cells, which did the work very well indeed. A less number would have done; but in this case, there was very little power in the electro-magnets of the bells.

One great feature in all batteries, to which the writer would draw special attention, is the purity of the materials used. Whatever form of battery is used, unless the materials are the purest obtainable, it will not last as long as it ought, and the efficient working of the cell may be very much interfered with.

Leclanché has lately introduced a new form of cell, which he calls the agglomerate form. In this pattern, there is no porous cell; the crushed carbon and oxide of manganese with which the porous cell is packed are now reduced to a fine powder, and made into blocks under hydraulic pressure. Two of these blocks are secured to the carbon plate, one on each side, with India rubber rings. This form having, owing to the absence of the porous part, a very low resistance, furnishes a much more powerful current, but its lasting powers seem rather doubtful.

A galvanometer will be found of great service where electric signals are in use. By its aid, a faulty cell may be picked out from a battery in a few minutes. It will also tell when a wire is parted, and where. It will show a bad joint, leakage on the road or in the shaft. In fact, with a good galvanometer and a little practice, any intelligent man is quickly master of the signals under his charge. Failing a galvanometer, the tongue is a rough and ready but sure guide. By attaching two small wires to points between which a current should pass, and placing the ends of these wires one above and one below the tongue, both touching it, if a current is passing, a metallic taste is felt, and a sharp prick according to the strength of the battery.

BESSEMER STEEL FOR ENGINEERS' TOOLS.—How nearly Bessemer steel can be brought to crucible in its usefulness for tools is a matter than which there are few more important to the machinery engineer. The advance of the Bessemer metal in this respect means to him a considerable saving of money. It may not, perhaps, be generally known that the Barrow Hematite Steel Company is doing a good deal in the production of Bessemer steel for uses hitherto served by crucible steel. In addition to its usual out-turn of heavy steel, in the form of rails, blooms, tires, etc., the company is producing upward of 1000 tons a week of special steel, which is worked up in various parts of the kingdom into all the following forms: Roll-turning and lathe-turning tools, chisels, files, shear-blades, rail drills, rail punches, shear steel for welding to iron, miners' drills and tools, picks, shovels, hand-hammers, roller bar and cotton spindles, locomotive-engine, wagon, carriage, coach, and furniture springs, bolts, nuts, rivets, pit ropes, telegraph, crinoline, and corset wire, umbrella frames, wire for musical instruments, and the like. Nor has cutlery itself been found too hard a test; for this special steel has been made even into razors with decidedly good results. Touching the extent to which the articles answer, it may be mentioned that a one-inch pit chain, made from a soft sample of this special Bessemer make, withstood a breaking load of 35·63 tons; elongation, 6 inches or 18 inches. The welding had been done by a smith not accustomed to chain work. This is very encouraging to machinery engineers, with whom Bessemer steels are gaining favor to the supplanting of cheap cast steels.

THE VENTILATION OF COAL CARGOES.—The committee of Lloyd's has received from the Board of Trade a report concerning the surface ventilation of the cargo of 2050 tons of coal carried in the Sutherlandshire from Hull to San Francisco, last year, from which it appears that advantages arise from the fitting of tubes for enabling the master to ascertain the temperature of the body of the cargo, as recommended by the report of the royal commission appointed to inquire into the spontaneous combustion of coal in ships. This ship has now again left Hull for San Francisco with soft coal as before, and with the same fittings. Her commander, Captain Inglis, highly approves of them, and will continue testing the temperature. It is stated that, while the Sutherlandshire was at San Francisco, three vessels loaded with coal on fire arrived, and that one of them, an American ship, had been on fire fifty-three days. When detained, the Sutherlandshire was fitted with a box ventilator on each hatch, namely, fore, main, and aft, passing down through the body of the coals. There were also one 14-inch iron cowl ventilator passing through forecastle and main decks, one trunk ventilator with skylight top leading through midship house and main-deck, one 18-inch iron cowl abaft mainmast leading to water-tanks, and two 12-inch cowls through poop and main-decks to store-room right aft. The alterations made were as follows: The two aft ventilators were boxed and continued through the store-room deck to cargo. The tank ventilator was opened out to cargo at main deck, and the trunk and forecastle ventilators were accepted (being suitable for surface ventilation). The three wood-box ventilators in the hatchways were removed, and testing pipes put in their places. A record was kept of the temperature of the cargo.

MINING IN NEW SOUTH WALES IN 1883.

We are indebted to Mr. Harrie Wood, Under-Secretary for Mines of New South Wales, for a copy of the report of his department covering the year 1883. Besides the usual excellent summary of the statistics of production by that gentleman himself, and the reports of the wardens and mine registrars, the volume before us contains a number of special reports that prove how earnestly the colonial government is doing every thing to foster the development of one of its leading industries. How important they are may be gathered at a glance from the following table:

THE MINERAL PRODUCTION OF NEW SOUTH WALES.

	1882.	1883.
Gold, ounces	140,469	123,806
Silver, "	38,618	77,066
Coal, tons	2,109,282	2,521,457
Shale, "	48,065	49,250
Tin, "	8,669	9,125
Copper, "	4,958	8,957
Iron, "	7,476	3,434
Antimony, "	1,068	375
Lead, "	11	30
Asbestos, "	7	..
Bismuth, "	2·14	3·7

Gold.—The falling off in the gold production has been great as compared with the yield in former years, as the following table shows:

PRODUCTION OF GOLD IN NEW SOUTH WALES.

	Ounces.		Ounces.
1874	270,823	1879	109,650
1875	230,883	1880	118,600
1876	167,412	1881	149,627
1877	124,111	1882	140,469
1878	119,665	1883	123,806

Mr. Wood says on this subject: "It is clear that the continued drought has had the effect of preventing the prosecution of prospecting operations during the year, and has seriously retarded the working of the older fields. Whether the falling off in the yield of gold can be accounted for by the absence of sufficient water to carry on the usual crushing and washing operations, or whether the decline is not in some degree due to the gradual exhaustion of such of the deposits in the older gold-fields as are capable of being profitably worked without the aid of steam, hydraulic, or other power, it is difficult to determine with any degree of certainty. It is quite certain that in the absence of new discoveries it is only a question of time, and that comparatively limited, before those deposits which can be worked by the individual miner must be exhausted; but with the breaking up of the drought, we may reasonably expect that prospecting operations will be resumed and new ground opened. Of course, there is an unlimited extent of auriferous country within the older gold-fields of this colony, which, worked with proper appliances on a large scale, would yield satisfactory profits and give steady employment to a large body of miners for many years to come. But until the necessary capital and skill is brought to bear on these deposits, or some new discoveries be made, we can not hope to see any large increase upon our output."

Some idea of the average grade of the rock treated in the quartz mills may be obtained from the following table:

AVERAGE GOLD YIELDS FROM QUARTZ MINES.

DISTRICT.	1882. Quantity Tons.	1882. Average per ton. ozs. dwts. grs.	1883. Quantity Tons.	1883. Average per ton. ozs. dwts. grs.
Bathurst	5,371	1 0 18·44	9,648	0 12 17·87
Tambaroora and Turon	1,604	1 7 12·84	3,931	0 15 20·00
Lachlan	7,198	0 10 20·94	11,686	0 11 9·42
Southern	3,044	0 7 16·36	3,159	0 10 19·66
Tumut and Adelong	9,520	0 19 14·76	483	1 9 14·70
Peel and Urilla	1,832	1 6 9·83	1,727	1 14 7·34
Hunter and Macleay	4,514	1 15 12·87	4,857	0 14 15·90
Clarence and Richmond	1,251	0 14 12·63	400	1 6 16·40

For 34,622 tons reported in 1882, the average yield of gold was 19 dwts. and 13·88 grains, and for 41,055 tons in 1883 it was 14 dwts., 15·78 grains, Mr. Wood adding that if a return of all the stone crushed could be obtained, the average would probably be still lower. From his report, it appears that some attention is paid to the working of the sulphurets, and the Huntingdon & Koch and E. B. Parnell processes are mentioned, without any details, however.

Coal.—The steady growth of the coal trade of New South Wales is best illustrated by the following table covering the past ten years:

THE COAL TRADE OF NEW SOUTH WALES.

YEAR.	Exports to intercolonial ports.	Exports to foreign ports.	Total exports.	Home consumption.	Total output.
1874	467,583	405,442	873,025	431,587	1,304,612
1875	518,853	408,154	927,007	402,722	1,329,729
1876	542,932	325,865	868,817	451,101	1,319,918
1877	563,757	351,970	915,727	528,544	1,444,271
1878	623,323	383,097	1,006,420	569,077	1,575,497
1879	621,087	376,962	998,049	585,332	1,583,881
1880	550,672	202,684	753,356	712,824	1,466,180
1881	657,135	372,709	1,029,844	739,753	1,769,597
1882	760,226	501,319	1,261,545	847,737	2,109,282
1883	855,704	656,741	1,512,445	1,009,012	2,521,457

Of the three coal-fields, the Northern District is the most important, having produced in 1883 1,899,620 tons, while the Western District turned out 232,418 tons, and the Southern District produced 389,419 tons, the latter two falling off while the first gained heavily.

The following is a series of analyses made during 1883 by Mr. C. Watt, the government analyst:

ANALYSES OF NEW SOUTH WALES COALS.

LOCALITY.	Hygroscopic moisture.	Volatile hydrocarbons.	Fixed carbon.	Ash.	Sulphur.	Specific gravity.
Lake Macquarie	3·80	23·90	55·50	6·80	....	..
Goulbourn	2·18	30·98	58·04	8·80	0·228	1·35
Goose Valley	3·60	29·70	59·70	6·96	0·050	1·34
Goose Valley	3·66	30·38	54·46	11·50	0·062	1·38
Dora Creek, Lake Macquarie	3·04	17·76	62·10	17·10	0·142	1·44
Dora Creek, Lake Macquarie	2·52	30·48	53·36	13·64	0·140	1·43
Wangenderry, Berrima District	1·74	31·06	52·00	15 20	0·300	1·38
Bowenfels	2·45	28·55	48·56	20·44	..	1·35
Ulladulla	1·50	33·04	57·40	8·06	1·11	1·31
Ulladulla	1·76	32·06	56·38	9·80	1·24	1·35
Capertee	3·25	25·41	60 24	11·10	0 39	1·39

Tin.—In spite of low prices, and scarcity of water, the output of tin has gone on increasing, and a geological examination of the Vegetable Creek field by Mr. T. W. E. David, whose illustrated report is appended, shows that, while the shallow stream deposits are undergoing rapid exhaustion, as well as the dry parts of the deep lead, the latter class of deposits is so extensive that there is little probability of exhaustion for many years to come. The principal formations of the district consist of altered Silurian and Devonian sedimentary rocks, metamorphic and intrusive granites, Tertiary clays and pebble drifts, and volcanic rocks. The tin-bearing lodes occur in the old sedimentary rocks and in the granites, but chiefly in the latter. These formations have suffered enormous denudation.

During the erosion of the valleys, volcanic outbursts took place, and the basaltic lava poured into and filled up some of the valleys, so that the rain-water still falling over the same area had to cut fresh drainage channels, which were formed generally along the edge of the basalt or across it, and therefore the old river-bed or deep lead is sometimes found beneath a butt or water-shed between the existing streams. In some places, the river channels have not been eroded down to the level of the old ones; while in others, they have been cut considerably deeper, in which case the old river-bed may be opened by tunneling in from the sides of the present valleys. There are, therefore, in this district various tin-bearing drifts that have been deposited at different times, the Tertiary deposits, generally covered with basalt, being the oldest, and the existing creek beds containing the youngest. How rich the deep land has proved in placers is shown by the statement that one company is said to have taken 2000 tons of ore from five acres. The following table shows the development of New South Wales tin mining since the opening of the fields in 1872:

PRODUCTION OF TIN IN NEW SOUTH WALES.

Year.	Ingots. Tons.	Ore. Tons.	Total. Tons.
1872	47	849	896
1873	911	3,660	4,571
1874	4,101	2,118	6,291
1875	6,058	2,022	8,080
1876	5,449	1,509	6,958
1877	7,230	824	8,054
1878	6,085	1,125	7,210
1879	5,107	814	5,921
1880	5,476	682	6,159
1881	7,591	609	8,200
1882	8,059	611	8,670
1883	8,680	445	9,125

Copper.—As the table given below shows, copper production in New South Wales took a sudden leap in 1883. It is difficult to decide, of course, how low prices will affect this movement in the current year:

PRODUCTION OF COPPER IN NEW SOUTH WALES.

Year.	Ingot. Tons.	Ore and regulus. Tons.	Year.	Ingot. Tons.	Ore and regulus. Tons.
1874	3,638	522	1879	4,107	36
1875	3,520	157	1880	5,262	132
1876	3,106	169	1881	5,361	133
1877	4,153	360	1882	4,865	93
1878	4,983	236	1883	8,873	84

The most important producer remains the Great Cobar Company, which since it started, in July, 1876, has smelted 98,916 tons of ore, producing 13,388 tons of pure copper. In 1883, there were smelted 18,096 tons, which yielded 2401 tons of metal. The second largest, the Nymagee Company, has made since it began operations in 1880, 3717 tons of fine copper from 24,007 tons of ore, the 1883 yield having been 1714 tons fine from 10,236 tons of ore. Among the other producers are the Mount Hope, the Great Central, the Givilambone, the Burraga, and the Burroeva.

So far as the other metals and minerals are concerned, they have not as yet attained any importance. It is reported, however, that extensive deposits of silver ores have been opened recently. A very interesting discovery, made in 1883, and which has since attained a very widespread fame, are the diamond-fields around Bingera. The gems discovered in 1883 were pure in color, but small, and the district was suffering from that curse of the country, the drought.

According to reports of more recent date, the owners of some of the claims have begun ordering machinery, and it is expected that there will be a rapid opening out of the deposit, which is six feet and upward thick and covered from 40 to 80 feet deep.

About two years since, the colony established the office of Examiner of Coal-Fields, whose duties are similar to those of mine inspectors elsewhere. For the year 1883 he reports the loss of 8 lives by fall of coal, 2 by being run over by loaded skip, and 1 each by a fall of stone, by the explosion of loose powder, by the upsetting of a dray, by the explosion of a shot, and by being thrown off a train on an incline, or 15 in all.

Two years ago the government of New South Wales ordered a number of diamond drills, which are in charge of Mr. W. B. Henderson, superintendent of drills, whose report is of considerable interest. The original plant of six drills was found insufficient, and an additional one was bought, and two more ordered in America. "These latter two machines," Mr. Henderson says, "are constructed on quite a new principle, and are adapted for both surface and underground work. The engines are stationary, compound, and the feed gear can be altered while the work of boring is going on; the couplings of the rods disconnect by one half-turn of the wrench being applied, and by means of a register connected with the thrust the pressure to which the diamonds are subjected is indicated on the surface. This is an improvement of the greatest importance in work, and can not fail to decrease the cost of boring, as by means of this register it is believed that the loss of diamonds will be much reduced. The diamond drills bored during the year 6643 feet, at an average cost of 10s. 3d., or 12s. 10¾d. including transportation from one point to another, carriage to Sydney for repairs, etc. The public contributed for the use of the drills £4523, while the actual cost was £4285. In boring 6017 feet, 5090 feet of core, or 84·35 per cent, was obtained, a very good average. At four points, holes were put down to prospect for coal, 13 holes being drilled from 202 to 498 feet deep. The boring 6091 feet in the aggregate took 5768 hours for boring and extracting the core, etc., making the average time per foot bored 1 hour 1·1 minutes." The diamond drills were largely used, also, for drilling artesian wells, with striking success in some instances. Mr. Henderson, with right, of course, holds the diamond drill to be unsuitable to bore through alluvial deposits in search of water. He publishes interesting tables showing the cost of boring in detail for every drill. There is one practice adopted to which it is worth while to call attention. Mr. Henderson says: "Diamonds are supplied to each engineer in charge on separate form to report sheet, weighed, and each diamond bearing a distinctive mark: duplicate copy of this report is retained in the drills office, and thus, whenever any particular diamond is reported fractured in working the field, the duplicate in the office is referred to, noted, the cut set off against the work, the fractured or worn diamond returned to the office, and hence a complete system is adopted which not only enables the wearing capabilities of a particular class of diamonds to be ascertained, but also is the key to control the principal cost of running drills."

Mr. C. S. Wilkinson, geological surveyor in charge, has made a special report on two very unusual occurrences, auriferous antimony lodes at Hill Grove and auriferous and argentiferous bismuth lodes near Glen Innes. The auriferous antimony lodes occur in metamorphosed sedimentary rocks, probably Devonian. The reef, which traverses altered slates, consists of a network of quartz veins, which give it a brecciated appearance. A granitic dike accompanies the reef and generally divides it into two, both varying in thickness. Oxide and sulphide of antimony carrying gold which is sometimes distinctly visible, occur in bunches.

The bismuth lodes of Yarrow Creek at Kingsgate are reputed to be pipe veins or oval masses of quartz of variable thickness, descending in a more or less vertical direction in the granite, one of them being 27 feet in diameter. Nests or bunches of native bismuth, sulphide, carbonate, and oxide of bismuth occur, with batches of molybdenite. The ore generally carries gold up to a few ounces. All the bismuth veins as yet found occur in the granite, within a short distance of slate.

THE BROWN HOISTING AND CONVEYING APPARATUS AT COXE BROTHERS & CO.'S MILWAUKEE COAL-DOCKS.

(WITH SUPPLEMENT.)

We have for years so frequently and so fully dwelt upon the great possibilities and the actual growth of the Western anthracite coal trade that we need not now do more than refer to it briefly. A development of the past few years has been the growing importance of Milwaukee as a distributing point. Recognizing this fact, Messrs. Coxe Brothers & Co., well-known as miners of Cross Creek Lehigh coal, whose general Western office of their agents, Messrs. E. B. & S. W. Ely, is at No. 87 Dearborn street, Chicago, have extended their facilities by establishing coal-docks at Milwaukee. After a thorough examination of the methods in use, they have equipped them fully with the Brown shed tramway system for the unloading and transferring of coal. The adaptability of this system to the variety of purposes which the handling of coal calls for, and its success in enabling the shipper to deliver his coal in first-class condition, makes a description of the plant of particular interest to the coal trade.

The accompanying supplements represent a new and improved system for handling coal, etc., in connection with the sheds for its storage, which has been erected on their dock. The storage-shed is 400 feet long, 164 feet wide, and 60 feet high at the rear, sloping to 42 feet hight at the face of the dock. The roof of the shed is trussed to avoid posts, and on the bottom chord of the truss is a rail on roll-carriers, which in turn hold the tramway itself. Thus the tramway may be moved sideways the entire width of the shed. The tramway runs the whole length of the building, and is continued 30 feet farther at the dock end by lowering a hinged apron or boom over the vessel after she is fastened to the dock. The side view of the shed shows the aprons in this position.

On the tramway travels the Brown patent hoisting and conveying machine, carrying a tub of coal weighing between 1600 and 1700 pounds. The machine hoists the tub out of the vessel, and conveys it back under the shed to any desired point, and either dumps or lowers the tub as may be desired, the movements of the machine being entirely controlled by one operator stationed in the top-house at the rear of the shed. The vessel is placed at the desired point in front of the shed, and when so fastened, the tramways (three in number) are adjusted sideways to fit her hatches, the aprons lowered and the machine set in motion.

Near the center of the shed, three car-tracks pass through it, and a bulkhead (which does not appear in the rear view) is built on each side of the tracks. These bulkheads are pierced with improved chutes for loading box-cars, and are capable of continuously loading 1800 tons into the cars. Each of the three machines with which the shed is fitted is operated by a hoisting-engine. One man is needed in the top-houses for each machine, while the engines are so grouped below that one engineer operates them all.

The small building on the left in the side view, No. 1, is the boiler-house, which contains one boiler to supply the engines. When no vessel is to be unloaded, the machines are used for transferring coal from various

parts of the shed to the bulkheads. Coal can be picked up at any point in the shed, and, being carried the required distance, may be lowered to any distance before dumping, thus saving any breakage in starting piles of coal. Since the loss from breakage depends entirely on the number of times the coal is handled, the economy of this system is apparent, as the material is handled fewer times on its way from vessel to car, or *vice versa*, than in any other arrangement.

This shed tramway apparatus was put into successful operation this season, and the results of its actual work show that, working the three tramways from three hatches of the vessel at once with the ordinary number of men to each hatch, the plant is capable of unloading from vessel directly and carrying the entire length of tramway and then depositing the coal at the rate of from 90 to 100 tons of coal an hour, using tubs of from 1600 to 1700 pounds capacity each. If tubs of one ton capacity each are used, which is generally the case with this apparatus, an even larger output could be accomplished in the same time, as the machines with the larger tubs make the same number of trips an hour as with the smaller ones, the machines and engines being designed for the rapid handling of loads of from one to one and a half tons.

The storage capacity of the present plant shown in the drawings is about thirty-five thousand tons of coal; and when increased to the contemplated size, the shed will cover and store at one time 100,000 or 120,000 tons.

During the season of navigation, a great deal of the coal is loaded directly from vessels into cars by being deposited in the bulkheads or chutes from which it is run over the proper screens into the cars for shipment to the West and Northwest by the Chicago, Milwaukee & St. Paul Railroad on the line of which the dock is situated.

The saving in the first cost of unloading from vessels, handling and storing in shed, and in loading cars by this system has been shown in many cases to be from fifty to eighty per cent of the cost by the ordinary methods. Moreover, the waste from the handling of coal by this system is not more than one fifth that by others.

This plant was designed and the machinery furnished by the Brown Hoisting and Conveying Machine Company of Cleveland, Ohio, which is the owner of the various patents covering the different handling systems it builds. Through its use, Messrs. Coxe Brothers are in a position to dispatch vessels with promptness and load box-cars directly or from accumulated stock in excellent condition at short notice.

"MINERAL BLOSSOMS."—Our friends of the Chicago *Mining Review*, about a year or two since, struck what may be termed, in the slang of the day, an intermittent "gas" well, which has since spouted weekly in its columns. We have glanced with wonder and pity at the emanations of this profuse writer, who glories in the euphonious name of J. Van Cleve Phillips; and since probably only a few have the opportunity to follow his amazing vagaries, we quote the following, one of his latest gushes:

"The law of the universe is that each positive atom is continually seeking its negative, and by this process the knowledge of the vein is transferred to the mind. This includes the vein in all its relations, to valleys, creeks, rivers, springs, knob, ridge and mountain; its course, dip, enclosing rock, coloring matter in the clay salvages that follow the vein, and to its drainage, both on the surface and in its subterranean course and depth, whether it is a blanket, gash, pipe, stratified, rake or fissure vein, and the index to the private history of the vein is to be found at some point along its course, in the form of iron, calc-spar, quartz, or other crystals, which are properly mineral blossoms. The physical dress of these minute crystals have locked up in their angles a reference to the history, character of the vein, and its metal contents. These nature has placed at the 'grass roots' to tell the miner of the mineral status of the vein, whether it is a vagrant, side or central vein, that knowledge is lodged in these crystals, for the same crystalline force that filled the vein gave the physical form to the blossoms, and the blossoms are the index to the history of the vein. You might place before one man a manuscript in Chinese, Greek or Latin, and it would be unintelligible, another man will read it as if large English print—so it is with the explorer—he must be able to translate the language of these surface blossoms.

"Every field geologist, and all miners and explorers are continually reading this science from observations. The observer may never have looked in a book on geology, nor have any idea of the classification of rocks, or ores, yet is all the time taking lessons in geology—as all the geology of the mineral field is written in the strata and vein system, nothing can be added or taken away—it can only be translated, and this is done by observation. The transposing of what is in the vein system to the mind is called science, and the ability to make the translation entitles the man to be called a scientist. To reduce what is in nature to a minature form on paper is called art, which causes the poet to say, 'All nature is but art.' All supposed chance in direction, all apparent discord can be resolved into harmony. But this can only be so by each atom in the structure of the vein, having taken its place by the constancy of action of crystalline, geometric laws.

"If the miner and explorer can realize these facts, and that the district he is prospecting has recorded in the strata and veins, the private memoirs of that part of mother earth, he will begin to have more respect for his business, as he will realize that he is dealing direct with the secrets of nature, and may be reading for the first time a portion of the private diary of the life of the world.

"This record is before him as the compilation of vast periods of time, and which leads to the conclusion that the mineral district with all its phenomenon, was seen in the ideal before the world was, and that ideal structure is now physically in rock, clay and ore before the explorer. As the New York, Chicago and St. Louis post office buildings were seen in the ideal by the architect before the rock was quarried or foundation had been excavated, so the Creator saw the world with all its mineral fields, and their vein system before the world was, unless this was so, all would be discord, instead of a well digested system, of adapting means to ends, and the discovery, rise, progress and development of a mineral field, being as a well ordered drama, with its prelude, casts, and ages, and if its industries did not form an oratorie, it would simply be a hurdy gurdy."

[The proof-reader has religiously "followed copy" in reproducing this sublime "oratorie."]

THE LAW OF THE APEX.*

By Rossiter W. Raymond, New York City.

(*Continued from page* 106.)

In justice to Judge Moses Hallett, whose decisions have been criticised in this paper, it should be added that, while he has attempted to construe the law under great difficulties, and in some instances may have given it a construction which it will not bear, he recognizes clearly its imperfection, and favors its radical reform. In a letter to the Public Lands Commission,† Judge Hallett says:

"It is safe to say that the greater part of the legal complications for which mines are notorious over all other property grows out of the practice of dealing with lodes as distinct and severable from the earth in which they may be found. In condemnation of that policy, it is only necessary to say that very many lodes have not that character, and of those that are pretty well defined it is often difficult and sometimes impossible to distinguish one from another. If we can return to the common law principle which gives to the owner of the surface all that may be found within his lines extended down vertically, we should avoid hereafter fully one half the controversies that now embarrass the mining industries of this country."

The "common law principle" does not, as Judge Hallett seems to imply, forbid the separation of the mineral right from the surface ownership. This has been shown on a preceding page. But he is perfectly right in his main proposition, and has clearly indicated the heart of the trouble. The government, in exercising its undoubted right to separate the two properties, has violated, not common law, but common sense, by conveying a thing which it is difficult to recognize, describe, and bound.

II. THE APEX.

As we have seen, the extra-lateral title of a lode claim is controlled by the possession of the "top or apex." These terms appeared for the first time in the act of 1872. They were not miners' terms. I have reason to believe that they were used instead of the word "outcrop," in order to cover "blind lodes," which do not crop out. The conception of an apex, which is properly a point, was probably taken from the appearance of a blind lode in a cross-section where the walls appear as lines, and the upper edge as a point. The term may also have been intended to cover the imaginary case of an ore-deposit which terminates upward in a point. We may, however, dismiss from consideration the case of a simple point, and safely assume that the apex is the same as the top, and is either a line or a surface.

A few definitions of the apex may be quoted with advantage before further discussion of it. The following are taken from the Report of the Public Lands Commission, transmitted to Congress by President Hayes, February 25th, 1880. This Commission, consisting of Messrs. J. A. Williamson, Commissioner of the General Land-Office, Clarence King, Director of the Geological Survey, A. T. Britton, Thomas Donaldson, and J. W. Powell, issued a circular containing a series of questions, to which numerous answers were received. Under the head of "Lode Claims," the fourth question was (in part):

"What do you understand to be the top or apex of a vein or lode?"

Among the answers to this question were the following:

1. "The highest point at which the ore or rock is found 'in place,' or between the walls of the vein, and not a 'blow-out,' or part of the ledge broken down outside the walls." (John Wasson, United State Surveyor-General, Arizona, p. 1.)

2. "The croppings or the exposed surface of the vein or lode." (Thomas Waser, land-attorney, Eldorado County, Cal., p. 229.)

3. "The highest point at which it approaches or reaches the natural surface of the ground." (William N. Byers, Denver, Colo., p. 259.)

4. "The highest point of its outcrop in rock in place." (S. W. Hill, mining engineer, Leadville, Colo., p. 279.)

5. "That point at which the vein enters or emerges from rock in place." (Henry Neikirk, miner, Boulder, Colo., p. 300.)

6. "The top or apex is generally understood to be that part of the lode that is first discovered. A vertical lode has its apex at the surface." (H. W. Reed, United States Deputy Mineral Surveyor, Ouray, Colo., p. 303.)

7. "Where the mineral-bearing crevice-matter is first met, either on the surface, or, as in blind lodes, underground; but wherever it is met, there begins the apex." (Carl Wulsten, United States Deputy Mineral Surveyor, Rosita, Colo., p. 316.)

8. "The croppings or highest point of the ledge appearing above or discovered beneath the surface." (William Hayden, lawyer and mine-owner, Deadwood, Dak., p. 321.)

9. "The highest point of the center of the ledge." (Daniel Bacon, Boise City, Idaho, p. 329.)

10. "The outcrop in the highest geological level, whether this is accidentally higher or lower than some outcrop caused by denudation or slip. (W. M. Courtis, M.E., Wyandotte, Mich., p. 339.)

11. "Where it comes through or to the surface of the rock in which it is incased, though it may be covered, and sometimes is with twenty or thirty feet of loose earth." (Wesley P. Emery, miner, Butte City, Montana, p. 352.)

12. "That portion of the lode along its course which outcrops to the surface, or, if 'blind,' which comes nearest to the surface." (Walter McDermott, M.E., Lewis & Clarke County, Montana, p. 372.)

13. "The strike or course of a vein is determined by a horizontal line drawn between its extremities at the depth at which it attains its greatest longitudinal extent. The dip of a vein (its 'course downward,' Rev. Stat., § 2322) is at right angles to its strike; or, in other words, if a vein is cut by a vertical plane at right angles to its course, the line of section will be the line of its dip. The top or apex of any part of a vein is found by following the line of its dip up to the highest point at which vein-matter exists in the fissure. According to this definition, the top or apex of a vein is the highest part of the vein along its entire course. If the vein is supposed to be divided into sections by vertical planes at right angles to

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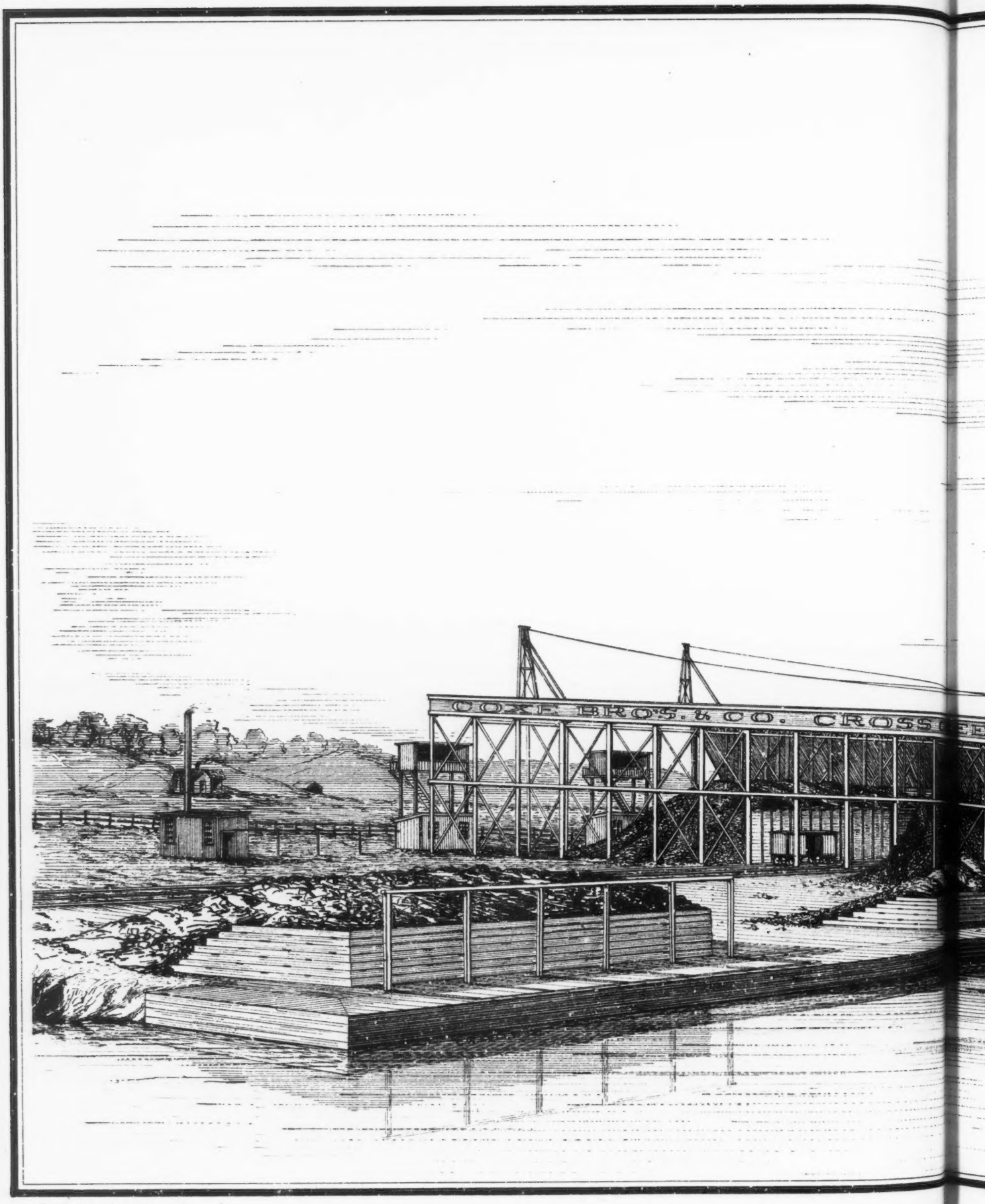
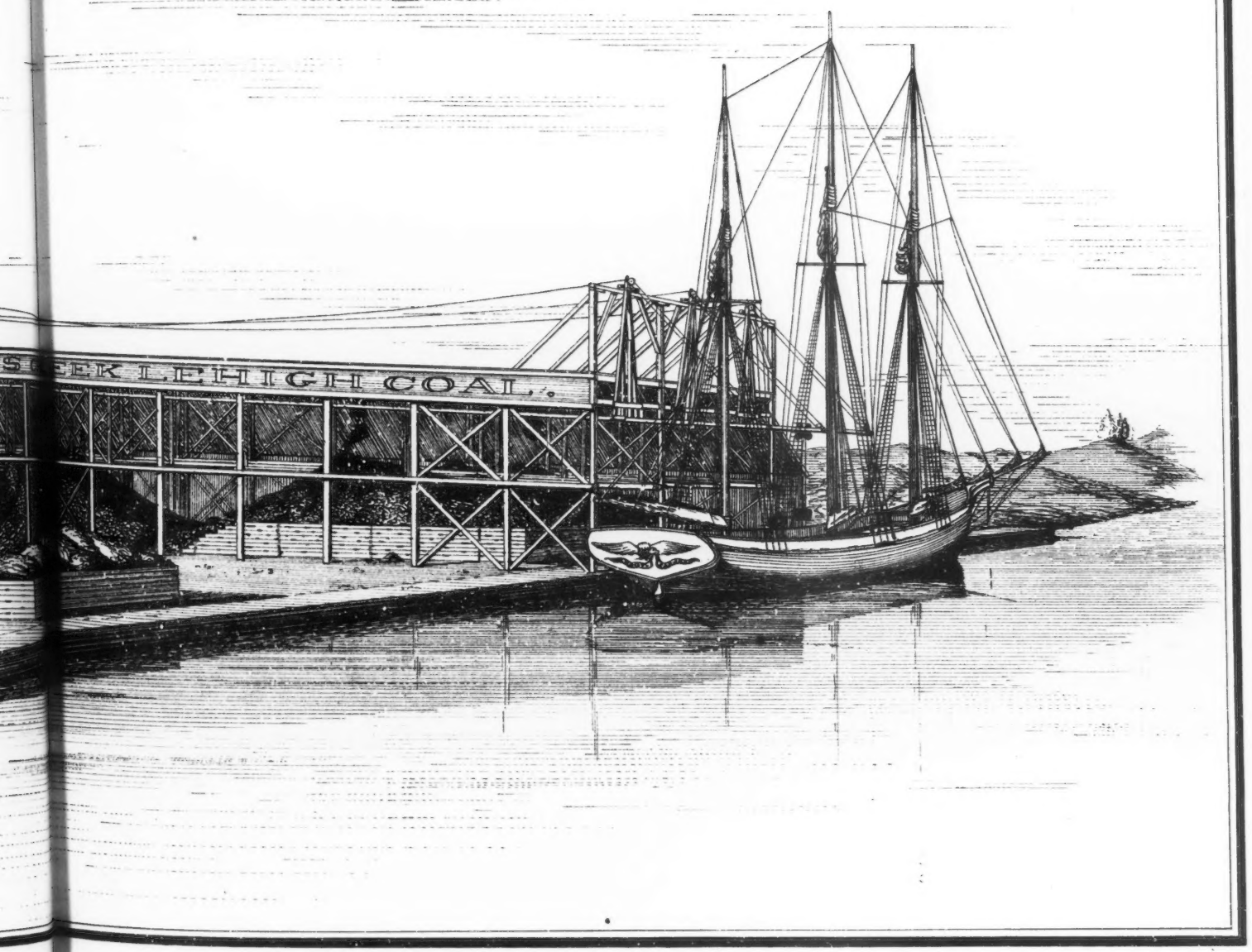
* Read at the Troy Meeting of the American Institute of Mining Engineers, October, 1883.

† *Report of the Public Lands Commission*, Washington, 1880, pp. xxxvii., 269.



The Engineering & Mining Journal.

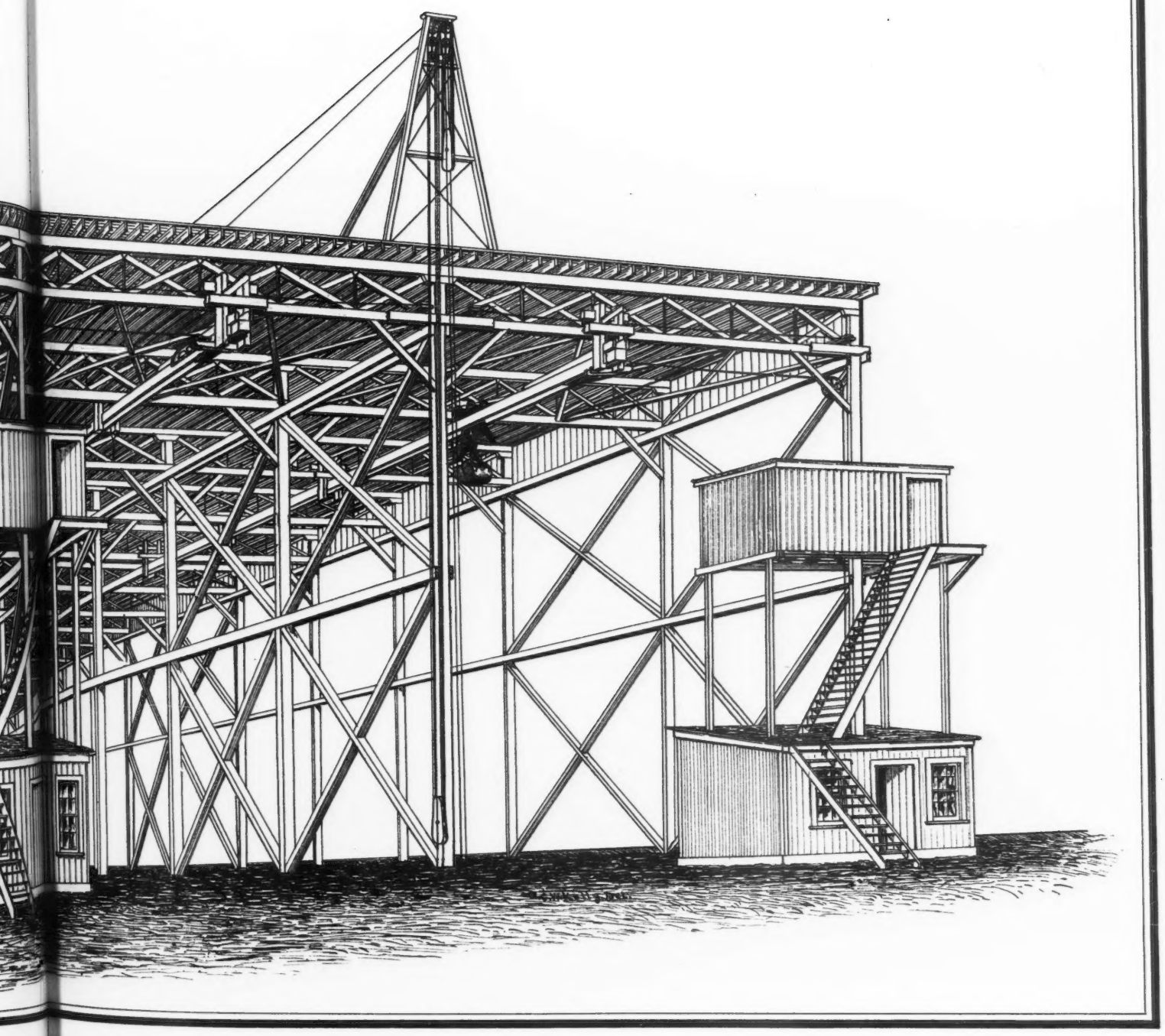
NO. 1. THE BROWN PATENT HOISTING & CONVEYING APPARATUS APPLIED A C



PLIED] A COAL-SHED ON THE DOCKS OF COXE BROS & CO., MILWAUKEE, WISCONSIN.

The Engineering & Mining Journal.

NO. 2. REAR VIEW OF COAL-SHED, L



OAL-SHED, LOOKING TOWARD THE RIVER.

its strike, the top or apex of each section is the highest part of the vein between the planes that bound that section; but if the dividing planes are not vertical, or not at right angles to a vein which departs at all from a perpendicular in its downward course, then the highest part of the vein between such planes will not be the top or apex of the section which they include. The strike or course of a vein can never be exactly determined until it has been explored to its greatest extent; but a comparatively slight development near the surface will generally show its course with sufficient accuracy for the purposes of a location. The dip, having an exact mathematical relation to the course of a vein, is of course undetermined until the strike is determined; but closely approximated by taking the steepest (the nearest a vertical) line, by which practically the line of dip in a vein can be followed downward. The top or apex of a vein is usually the first thing discovered. Sometimes a blind lode, so-called, is encountered in driving a tunnel or sinking a vertical shaft, and then, of course, the top or apex can not often be found except by tracing it toward the surface by means of an incline. Of course, there are irregular mineral deposits, departing widely in their characteristics from the typical or ideal vein which seems to have been in the mind of the framer of the act of 1872. To such deposits, the foregoing definitions will not apply; and in my opinion, great difficulty will be experienced in any attempt to apply the existing law to them. I believe, however, that instances of such formations are comparatively rare, none having fallen under my own observation." (W. H. Beatty, Chief-Justice of Nevada, p. 399.)

14. "Croppings." (Edward R. Chase, mining engineer, Wells, Nev., p. 407.)

15. "The line such vein would make in its intersection with the surface, calculated from its true dip at each point." (Robert M. Catlin, mining engineer, Tuscarora, Nev., p. 412.)

16. "The uppermost part of the ledge between the two walls, although these may be missing." (D. Van Lennep, surveyor, Winnemucca, Nev., p. 418.)

17. "In case the vein outcrops at the surface, I would call any portion of such outcrop the top or apex. If the vein does not reach the surface, then the highest point to which the vein or lode can be traced is the apex—not necessarily the nearest point to the surface, but the absolute highest point." (Lawrence F. J. Wrinkle, mining surveyor, Virginia City, Nev., p. 436.)

18. "The summit, comb, crest, or highest point on the ridge of a vein or lode." (William McMullen, civil engineer, New Mexico, p. 451.)

19. "The upper edge; that part which is first reached or passed, in developing a mine." (George H. Pradt, United States Deputy Surveyor, Laguna, N. M., p. 456.)

20. "The outcrop, or, in case of a blind ledge, that line of the vein or lode which approaches the surface the nearest." (Charles M. Rolker, mining engineer, New York, p. 462.)

21. "That portion of the vein that is visible in the country-rock when the loose dirt or earth has been removed. Some veins stand up above the country-rock like a wall. The top of such veins would be the highest part of such wall above the ground or bed-rock." (Charles M. Foster, surveyor, Baker City, Oregon, p. 470.)

22. "Its highest point at any given place." (M. T. Burgess, mineral surveyor, Salt Lake, Utah, p. 487.)

23. "The outcrop." (James H. Martineau, United States Mineral Surveyor, Cacheco, Utah, p. 505.)

24. "The point at surface where the ore is met with; either superficially seen in the croppings, or just beneath the surface." (Edward B. Wilder, United States Deputy Mineral Surveyor, Salt Lake, Utah, p. 521.)

25. "Either the outcrop or crevice between walls at the top of bed-rock." (S. W. Downey, United States Delegate of Wyoming, p. 552.)

26. "The vein at the surface." (Charles W. Cross, attorney, Nevada City, Cal., p. 571.)

27. "Outcrops generally." (E. D. Bright, Trinidad, Colo., p. 577.)

28. "The width of the vein or lode on the surface; but the United States mining law means the top or apex to be the width of the claim, 600 by 1500 feet." (J. C. Coony, Fort Bayard, N. M., p. 619.)

29. "The outcropping of the vein." (William E. Hall, miner, Big Cottonwood, Utah, p. 632.)

30. "Where it has been projected through the country-rock by an acting subterranean agency or force." (Mason M. Hill, Salt Lake, Utah, p. 636.)

The foregoing definitions exhibit all degrees of precision and comprehensiveness. Yet neither of them is sufficiently precise and comprehensive to cover all possible cases. No. 13, that of Chief-Justice Beatty, is, as might be expected from his long experience and acknowledged ability, the most carefully guarded; yet it seems to be rather an ideal definition than a construction of the law and the common usage upon which the law was based. Nearly all the definitions above given practically agree in one thing, that while an apex need not be an outcrop, an outcrop must be an apex. In this they are probably right, with the exception of cases in which portions of the side of a vein have been laid bare by the removal of one wall, so as to leave the vein exposed. Such exposures might be outcrops; they could scarcely be termed apexes. The trouble with Judge Beatty's definition is, that it seems to require the deep working of a mine before its strike and dip, and from these the proper position of the apex, can be determined. If he had said, "The strike is determined by a general direction of a horizontal line drawn midway between the walls of the vein," he would have avoided this objection. But the strike or course of the vein, which is supposed to be followed by the location upon it, is not necessarily the true strike. In the Flagstaff case (8 Otto, 463), the U. S. Supreme Court used the following language:

"The principal difficulty in the case arises from the fact that the surface is not level, but rises up a mountain in going from the Titus discovery to the Flagstaff. The dip of the vein being northeasterly, it happens that, by following a level beneath the surface, the strike of the vein runs in a northwesterly direction, or about 50 degrees west. In other words, if by a process of abrasion, the mountain could be ground down to a plain, the strike of the vein would be northwest instead of west, as it now is on the surface; or, at least, as the evidence tended to show that it is. In that case, the location of the defendant in error would have the vein to its right, and the location of the plaintiffs in error would not reach it until several hundred feet to the north of the Flagstaff discovery.

". . . We do not mean to say that a vein must necessarily crop out upon the surface, in order that locations may be properly laid upon it. If it lies entirely beneath the surface. and the course of its apex can be ascertained by sinking shafts at different points, such shafts may be adopted as indicating the position and course of the vein, and locations may be properly made on the surface above it, so as to secure a right to the vein beneath. But where the vein does crop out along the surface, or is so slightly covered by foreign matter that the course of its apex can be ascertained by ordinary surface explorations, we think that the act of Congress requires that this course shall be substantially followed in laying claims and locations upon it. Perhaps the law is not so perfect in this regard as it might be; perhaps the true course of a vein should correspond with its strike, or the line of a level run through it; but this can rarely be ascertained until considerable work has been done, and after claims and locations have become fixed. The most practical rule is to regard the course of the vein as that which is indicated by surface outcrop, or surface explorations and workings. It is on this line that claims will naturally be laid, whatever be the character of the surface, whether level or inclined."

In the Grand View case (July, 1879) already quoted, Judge Miller used the following language:

"The top or apex, within the act of Congress, is the highest end or termination of the vein, and this is so, even though at any intermediate point or points, where the vein is continuous, it rises higher than such highest end, it being essential to such 'top' or 'apex' that there be no vein continuing beyond it. It must be the end of the vein which approaches nearest to the surface. That is the substantial meaning of it. . . .

"The top of the apex of a vein, within the meaning of the act of Congress is the highest point of that vein where it approaches nearest to the surface of the earth, and where it is broken on its edge so as to appear to be the beginning or end of the vein. The word outcrop has been used in connection with it, and in the true definition of the word, outcrop, as it concerns a vein, is probably an essential part of the definition of its apex, or top; but that does not mean the strict use of the word outcrop. That would, perhaps, imply the presentation of the mineral to the naked eye, on the surface of the earth; but it means that it comes so near to the surface of the earth that it is found easily by digging for it, or it is the point at which the vein is nearest to the surface of the earth; it means the nearest point at which it is found toward the surface of the earth. And where it ceases to continue in the direction of the surface, is the top or apex of that vein. It is said in this case that the point claimed to be the top or apex is not such, because. at the points where plaintiffs show or attempt to prove an interruption of that vein, in its ascent toward the surface, and what they call the beginning of it, the defendants say that is only a wave or roll in the general chute of the metal, and that from that point it turns over and pursues its course downward as a part of the same vein in a westerly or southwesterly direction. It is proper, I should say to you, if the defendants' hypothesis be true, if that point which the plaintiffs call the highest point, *the apex*, is merely a swell in the mineral matter, and that it turns over and goes on down in a declination to the west, that is not the true apex within the statute. It does not mean merely the highest point in a continuous succession of rolls or waves in the elevation and depression of the mineral nearly horizontal."

Upon this ruling was based the definition given to the word *Apex* in the writer's *Glossary of Mining and Metallurgical Terms* (1881), namely, "In the U. S. Rev.* Statutes, the end or edge of a vein nearest the surface."

Coupled with other rulings in the Colorado courts, this definition locates the apex where the vein is found nearest the surface with both walls in place; and hence in many cases the apex, as thus defined, might be so far from the outcrop, or from the highest exposure of the vein with one wall in place, as not to be within the same location.

But another and most troublesome point has been raised concerning the apex. It will be noticed that all the definitions are somewhat vague as to whether it is a point, line, or surface. But this is an important question, because the condition of extra-lateral title under the law is that the apex shall be within the claim. Now it often happens that the location does not cover the entire width of the lode. This may happen through ignorance on the part of the locator, or an erroneous determination of the center line of the lode. Or it may be that the lode is wider than the local regulations permit the location to be. According to the statement of Mr. Burgess to the Public Lands Commission (*Report*, p. 487), this is the case with the Flagstaff, South Star, and Little Cottonwood mines in Utah. It is also the case with the Richmond and Eureka mines on Ruby Hill, Nevada. Yet in the Flagstaff and Eureka decisions (both leading cases, one of them in the U. S. Supreme Court, and the other tried before three eminent judges, one of whom was Justice Field of the U. S. Supreme Court), this feature was not considered by the Court as affecting the extra-lateral rights of locators. So far as I know, it was not raised by either side. But in the case of G. W. Hall *et al. vs.* Equator Mining and Smelting Company *et al.* (Colorado Central *vs.* Equator), Judge Hallett pronounced in the U. S. Circuit Court of Colorado, February 3d, 1879, an opinion from which the following extracts are taken: †

". . . As to all of the disputed ground, the principal question affecting the whole lode is whether, by locating a part of the width of outcrop, the whole may be taken—of several collateral locations on the course of a lode where the top or outcrop is of sufficient breadth to admit of more than one, are not all of equal dignity and force within their own lines? This question will admit but one answer, with such modification as may be hereafter suggested. The act of 1872 certainly requires a location to be along the course of the lode and to include the top of it, and it is believed that the act of 1866 is of the same effect. Defendants' location was made under the act of 1866, and probably some discussion of that view of the act would be appropriate in this connection. But it may

* Expanded by an ambitious compositor into "Revenue" Statutes, and thus finally published (*Transactions*, ix., 102), to the mortification of the author.

† See ENGINEERING AND MINING JOURNAL, March 22d, 1879. The abstract reported in Carpenter's *Mining Code*, 3d ed., p. 65, is much condensed.

be enough to say that defendants assumed to take the whole lode into their location: and if they failed to get the whole, either by their own omission or because of some restrictive provision of the local law, the result is the same. In either case, they can not now claim more than was taken by the location. The same rule is applicable to plaintiffs' location, and as to both of them it is no answer to say that the law would not admit a location of sufficient width to take the whole lode. If the law is illiberal, it is not for that reason the less controlling. If, however, a right to the entire lode can not be asserted under a location covering a part only of its width, as seems to be obvious, the location may be valid for the part described in it. If it is on the top of the lode, it is within the act, and so it ought to be good for the part within the lines extended downward, vertically, if for no more. Generally it may be said that a patent for a lode, issued under one of these acts, will convey all valuable deposits within the tract described, except such as may belong to lodes and veins which outcrop elsewhere and come into the tract in their downward course. *Prima facie*, the patentee must be the owner of all that lies within his lines. He has also the right to pursue veins and lodes which he holds by their outcrop into other territory, but in that the burden of proof is cast upon him to show the origin and continuous course of the vein out of his own land. Adjacent owners may equally invoke the rule which protects their possession, and demand full proof of the right to enter their territory. This is to say, every owner by patent shall be sovereign in his own domain; and whenever he goes beyond it, he shall recognize the equal right of others to the same protection. And thus it may be true that each of several locators on the same vein or lode will own all within his lines without being able to go beyond them. For as to his right to go into other territory, he can only do so in pursuit of a lode or vein that has its top and apex wholly on his own ground, and, having but a part of the lode in his territory, he can not comply with that condition. This appears to be a clear inference from the language of the act. The right given relates to veins, lodes, and ledges, the tops of which are inside the surface lines, which obviously means the whole and not a part. If, then, two or more collateral locations be made on one and the same vein, and the vein appear to be homogeneous throughout its width, we are authorized to say that each shall be confined within his own lines drawn down vertically. But what shall we say when there are veins within a vein or lodes within a lode, or when, as in the great Comstock, the vein is on one side of the lode, and a considerable body of crevice-matter on the other side?

"The occurrence of veins in other veins, applying the word first to the sheet of ore which is often called the pay-streak, and again to the general mass of the crevice embracing the ore and gangue, will not be controverted. In this case, the witnesses have spoken of several veins in the crevice-matter, using the word in its restricted sense to describe the ore as distinguished from the great body of the lode, and this is a matter of ordinary experience in the courts of the State, as we all know. This corresponds with a definition found in Webster's Dictionary, where it is said that the word is often limited in the language of miners to a layer or course of metal or ore. So, in works on topography, fissures are mentioned as occurring within other and probably older fissures, which if filled may furnish the conditions of a vein within another and larger vein. It may be that the word is generally applied to the whole body of the crevice; but if it is also used in a restricted sense to designate the sheet or mass of ore in which the pay is found, it may be taken to mean the last as well as the first. I have not heard the word lode used in the same sense; but as it means only a vein carrying ore, it would be even more significant than the latter. The word ledge is not in use with us, and therefore it affords no light as to the proper construction of the words with which it is associated in the act. As found in the acts of Congress, I think that the word vein may be taken in the limited sense to which reference has been made, as well as in the larger, and perhaps more usual, meaning of a crevice, belt, or zone of auriferous or argentiferous rock. To give effect to it in that way, we need not resort to the nice definitions and subtle distinctions of geological science. It is enough that such is an accepted use of the word among miners, and that it appears to coincide with the intention of Congress. So understood, the word vein, in the Equator patent, may refer to the sheet or crevice of ore that was found on the south wall of the lode; although, by reason of the narrowness of the location, it can not be said to refer to the entire lode. So also the word vein in the Central patent may be regarded as referring to the sheets and bodies of ore found in plaintiffs' openings, although for the same reason it can not apply to the whole lode. If all the ore in the lode had been found on the foot-wall, a location at the top would certainly be sufficient to carry the vein, although it might depart on its dip from the lines of survey. No one would then contend that a location to the northward, although on crevice matter, and although the locator should come on the vein in its dip, would thus acquire a right to it. The circumstance that bodies or sheets of ore have been found in the No. 5 and Central ground to the north, so long as there is no union of such bodies with that on the south wall, in no way affects the ownership of the latter. It stands as if no other vein had been discovered in all the lode; and the question is whether, after discovering and locating that vein, the defendants may follow it in its downward course, as distinguished from the lode, or the greater vein, if that word is preferred, of which it is unquestionably a part. If the ore had been distributed throughout the lode (using that word to describe the belt or zone of crevice matter) with any thing like uniformity, we should be unable to distinguish between the several parts, and, as we have already said, each party would then be confined to his own lines. But the vein on the south wall is, according to the evidence, quite distinct from the general mass of the crevice, and of such strength and continuity as may give it unity and individuality in law and in fact. There are several spurs or off-shoots coming in from the north which do not appear to affect the character of the vein. And there are some indications of a probable union and consolidation of all the ore-bodies west of the present development; but of these things we need not speak. In deciding this cause, it is enough to say that the vein on the south wall may be held as a separate and distinct location, with the right to follow it in its downward course so long as it retains its individual character. If it shall be found to unite with another vein in the same lode, the rights of the parties will be governed by those principles which are applicable to the union and intersection of distinct and separate lodes. All that has been said respecting this vein is based on the fact, as shown by the evidence, that its top and outcrop are wholly within the Equator ground. . . . .

(TO BE CONTINUED.)

REDUCTION-WORKS IN THE SAN JUAN COUNTRY.

San Juan County has made but little impression upon the markets of the world during the last six months, and it may have been thought that our disability has been due to inherent weakness of resource or to lack of energy on the part of our citizens. Such an opinion, however, if it exists, is very far from the truth. There has never been so large and so rich a production from the mines of this section as we have witnessed since last season. The dumps of the older mines are piled high with marketable grades of ore; storehouses, platforms, and railroad cars are crowded with the same, and new properties are encumbered to the point of serious inconvenience. Notwithstanding a remarkably annoying combination of untoward circumstances, there has never been a period in which the justification of our faith has been so plainly apparent as of late, when almost every possible obstacle has come between us and the realization of our hopes. The wonder is, that we have accomplished any thing at all, and what I am about to detail ought to afford to investors the most ample proof of the security of judiciously placed investments in this region.

Notwithstanding the unprecedented storms, fair shipments were made in January of this year, no break occurring in railroad communication until February 3d, when the track was blocked by enormous snow-slides, and we were left for more than a month without even mail facilities. Two or three times, the road was all but opened after weeks of vigorous work by very large gangs of laborers; but the remorseless elements repeatedly closed the cuttings, until it seemed but sheer folly to resist the forces of nature. Finally, however, on the 11th of April, a train was safely brought through to Silverton, the first we had seen for eleven weeks. Our mails had been coming in a roundabout and very uncertain manner for some five weeks. To get through the Animas Cañon, between Rockwood and Silverton, it was necessary to make several open cuts for long distances through snow-slides more than sixty feet in depth; in one case, no sooner had this been done than it filled in again, making it necessary to do the work a second time, and for some days a closing of the cañon was hourly anticipated. Some ore was moved from the mines in February until all available storage space along the line of the railroad was filled, and at intervals of two or three days the irregular trains carried off this accumulation, together with what could be brought down from the mines in the immediate vicinity of Silverton. Thus, during the remainder of April and the first half of May, we were provided with less than half our usual transportation facilities, and, later, we had regular trains for a fortnight. Then the wagon-roads became impassable from the softening of the snow, and soon the lower country became flooded, the railroad track was destroyed in many places, nearly every bridge was carried away, and we were again deprived of railroad facilities for six weeks, although the mails came through rather regularly on horseback from Durango. Thus, we have been denied our customary opportunities for traffic during five of the seven months of this year, giving us, practically, less than eight weeks of the worst season for making shipments. Yet we have actually shipped about 5000 tons of ore, an average of nearly 100 tons a day. Knowing whereof I write, I do not hesitate to say that, with reasonably fair opportunities, we can at least equal this record from August 1st to December 31st, giving us a total output, in less than two hundred available days of this year, of nearly 20,000 tons, as against some 12,000 tons last year, with every day available.

So much for quantity. The quality of the product is of no less importance, and on this very largely depends the future metallurgical history of the country. With very few exceptions, the money heretofore invested in this region in plants for the treatment of ores has been wasted. But comparatively few of those who have based their conclusions on this fact have arrived at the correct explanation of the failures—or perhaps I should say that what may have been regarded as failures and which are practically financial failures to-day, are in reality well enough adapted to the ores of the country, but they have been erected in advance of the demand. Now, just here is a text upon which no one can know more thoroughly than myself the futility of sermonizing for the general public. When you and I are numbered with the dead, kind reader, it will, perhaps, be quite feasible for the trained metallurgist to convince his employer or his customers that it is neither the duty nor the privilege of the ore-reducer to transmute metals or to get more from an ore than it actually contains. But in the present condition of the mining industry, it is almost useless to hope that even the axioms of our profession will be understood by those whose whole grasp of the science and practice of mining and metallurgy is comprised within the limits of ordinary real estate transactions. I shall, however, be well understood by my professional brethren, and also by that growing class of intelligent investors who would conduct the business of mining and reducing ores of the precious metals upon exactly the same principles that govern them in the handling of coal or iron. To such persons, it will be a very trite remark that wide experience, coupled with more than ordinary skill, is requisite for the successful inauguration and after-conduct of any metallurgical enterprise, and this will apply with extra force to the metallurgy of gold, silver, lead, and copper.

If we come to the study of the metallurgical history of the West with unbiased mind, we shall, in almost every locality, discover that grave errors have been committed, and yet I very much doubt if the popular opinion will, in one out of ten cases, place the blame where it rightly belongs. My own experience also teaches me that it is extremely rare to meet with any plant, the erection of which was not originally more or less justified by some actual condition which this same public opinion believed at the time to fully warrant the construction. As one example of this, let me cite the numerous smelters in San Juan County, of which no less than seven were built or partly completed, to say nothing of other plants for the reduction of ores. Every one of these was, of course, based on the supposition that an abundance of lead ores could be obtained. This

has been so clearly proved to be true that we must look for some other explanation of the idleness of all the smelters. Without looking deeper would it not seem that some other cause than fraud or incompetence or lack of capital must exist? Else why should every attempt at smelting have been finally abandoned, although three plants turned out bullion and one paid its owners handsome returns for at least two or three years? Nay more, is it not a fact that every metallurgist who has examined the question is averse to smelting in this county under present conditions, while only inexperienced persons insist that it can be made to pay? The cause of failure is not necessarily one of personal disability, nor yet of improper quality of ore, but it is plainly a matter of competition and comparative cost of fuel, labor, and materials, in which items the valley smelters clearly have an advantage over us more than equivalent to the extra cost of ore transportation. Other advantages are all on the side of Denver, Pueblo, and even Durango, leaving wholly out of the account the wider field from which they can collect their ores for mixtures, and the reduction of cost due to the greater capacity of their furnaces.

There are two idle leaching plants and one silver amalgamating mill in the county. Each one of these was undoubtedly built in the belief that it was just what was needed for the ores at hand, and, however premature may have been their erection, results have proved the existence of large bodies of ore suitable for these processes in a measure. Fraud is not charged in every case, and incompetence, if it were apparent, could have been easily remedied, yet not one of these works has succeeded in going as far as a complete trial run. The public knew that these works were just the thing for the camp, and the public still believes similar plants are required. Metallurgists of every grade all agree that such works can best be operated at a distance under conditions favorable enough to overbalance the extra cost of ore transportation.

Reduction-works, if they had ever a *raison d'être* in this county, became powerless with the advent of the railroad, and this fact may as well be admitted now as after other fruitless and costly failures. There is no point within these limits where smelting or other modes of reduction can be profitably carried on, except under some very peculiar conditions. I can imagine instances (and might give one or two actual illustrations) where the owners of mines with undesirable ores could advantageously operate works in connection therewith by purchasing choice varieties for mixtures; but it is very doubtful whether this could be done wisely without a vast amount of capital, and it certainly could not be done without the aid of the highest metallurgical talent. The conditions are not the same in every county, and I believe that smelting and other methods may be made quite successful in certain districts remote from the railroad, especially if very suitable ores abound. But the risks are great, even in such localities, the conditions being constantly liable to change. If the ores be especially choice and abundant, the railroad will surely come; and if otherwise, the works will be operated at great disadvantage. It would seem to a casual observer that Rico is in this favorable position to-day, and it behoves those who are already there to make the most of their opportunity by dealing liberally with the miners, so as to allow them no inducements to ship elsewhere.

It is not, however, a matter of indifference to the investor what may be the character of the ore taken from his mine, now that it is settled that it must be sent away for reduction. He is nearly concerned in the grading of his product in the market. Mines are commonly bought and sold as though it were of no consequence what mineral ingredients composed the veins. It is really the most difficult thing in the world for an ore-buyer to convince the miner that two ores assaying alike in gold, silver, and lead, or copper may have widely different market values; or to explain the seeming paradox, so familiar to metallurgists, that a very desirable metal, if in proper proportion, may render an ore almost worthless if present in too great quantity.

We have here a much greater variety of ores than is usual in one locality, owing largely to the wide range of geological formations at the surface. This statement does not apply so forcibly to San Juan County alone, as to the district that utilizes Silverton as its shipping point, including San Juan County and portions of Ouray and San Miguel counties. I shall have occasion, in another communication, to discuss the distribution of ores over this remarkable district—a subject that is teeming with interest from the point of view of the geologist, the miner, the metallurgist, and the capitalist; but it may be here remarked that, whether one be in search of a special type of vein structure, of a particular quality of ore, or of a field for the utilization of a particular process, it can be usually found ready to one's hand if he will but familiarize himself with the general distribution of veins. As to the general character of the ore, it is sufficient now to say that, while refractory and rebellious qualities are prevalent enough, the more easily worked varieties are very plentiful; and that, with some small streaks of very rich ore and occasional large patches of the same, large bodies of medium grade ore are practically unlimited. New discoveries are constantly made; and mines are now opened where only prospects have been seen before.

While on the subject of ore-reduction, it will not be amiss to consider the local situation, as it affects the nearly related beneficiating plants already erected and under consideration. The discussion of this topic from my own stand-point may be all the more timely from the fact that certain interested persons have taken it upon themselves to advocate new plants by condemning the old, and also because I happen to know that the causes adduced for the idleness of several of our concentrators are entirely erroneous.

Let an investor desirous of engaging in the business of ore-dressing spend a little time in this vicinity inquiring of those whom he meets whether a need of this kind exists, and why, if so, there are so many idle mills; he will meet with various replies. Some will tell him that all the mills are frauds, or in the hands of incompetent men; others will say that the proper machinery has not yet been introduced; and a very few will admit that a sufficient supply of proper ore has not yet been furnished to any mill. Only a few will hesitate to recommend our capitalist to come here and start his works on a very large scale, and to assure him that he will get more work than he can possibly do. It is not necessary for a moment to suppose that any one is intentionally deceiving by such assertions; but it is a very significant fact, nevertheless, that there is a perfect unanimity of sentiment on the part of all our metallurgists, and that they all agree in disagreeing with these opinions.

I do not say that none of the mills has been erected with fraudulent intent by incompetent projectors. On the contrary, I am certain that one or more have been built as "pocket speculations," and that some are even now planned by persons who are ignorant of the harm they will accomplish. But that there are a number of these mills that have proved successful so far as was possible under the circumstances, I am fully prepared to prove. One plant, intended for custom work, though not fully provided with slime-dressing apparatus,* succeeded very well with galena and pyritous ores, but was unexpectedly called upon to do the most of its work on peculiar ores, which required very fine crushing.

Another mill, innocently erected without sufficient knowledge of the principles of ore-dressing, was remodeled last year much after the style of a successful plant in a neighboring county. It may do good work under competent management, if ores can be secured. The mine that it was supposed would furnish the ore, has been idle for some time.

A third experiment was tried last year in connection with an abandoned smelter. The plant is a good one, and there is not much doubt of the ability of the operator or of the existence of suitable ore within easy collecting distance. The mill is idle because there is lack of mutual confidence among the projectors. It is certain also, that claims were made concerning the work done that were greater than the character of the ore would justify, and this exaggeration for the purpose of a sale defeated its own object when the truth was made apparent, although the facts themselves were sufficient to show the success of the works.

A fourth mill in the hands of an incompetent director, who made the mistake of adopting improved machinery, could be rendered profitable now to some extent; but the works were, of course, badly planned, and they are very much crowded and unprovided with sufficient dump room, besides being ill adapted to the particular ores that they were intended to concentrate.

A fifth plant is well designed, thoroughly constructed, and, with intelligent supervision, will accomplish all that was sought at its inception; but the ores that it must dress are not such as can be profitably concentrated. In this case, as in many another instance in the West, the very first condition of success has been left for consideration as the last.

The sixth example is that of the earliest in point of time. It consists of a small stamp-mill with the tailings passing to a Frue vanner through pointed boxes or *spitz-kasten*. This plant was designed to concentrate very rich ores at a time when freights were excessively high and the prices paid for mine products in this vicinity were exceedingly low. It has simply outlived its usefulness.

Another plant was designed primarily to dress the ores of particular mines according to the provisions of a contract that was not fulfilled by the mine-owners. It has been run successfully on a very large variety of ores, and although necessarily used as a custom mill, for which it was not originally planned, there has as yet been no instance of failure to concentrate any ore to which the plant is adapted. This mill was planned and operated wholly by the writer, and it is idle at present simply because the season's business has not afforded a steady supply of ore. The causes of this are several, chief among which is the character of the ores, which will not admit of the necessarily heavy cost of freight and treatment at present. In so far as these features are to be improved by the growth of the country, the business of concentrating will become more profitable. Another cause of idleness this year is the increased charges for smelting of concentrates and finely crushed ores that the smelters have levied.

Plant No. 8 in our list has but just begun its trial runs. Reports, as usual, at such times, are all in its favor; but whether successful or not, it is very sure to be condemned after a while by some of its patrons who may bring ore for treatment and be disappointed in the results. It is a common belief in Colorado that any ore that will not pay to ship directly to the reduction-works can be made to yield a good profit above all charges by concentration. The writer can trace the condemnation of his own mill directly to those who have brought him ores carrying from 5 to 10 ounces of silver and 40 per cent of lead, upon which the charges for mining, transportation to works, and concentrating have amounted to not less than $16 a ton of original ore, the product when two tons have been reduced to one with less than the average loss carrying from 9 to 18 ounces of silver and over 70 per cent of lead. In such cases, the very best possible work has been done, and yet the owner suffers a loss of from $6 to $12 per ton on his ore. In seven out of every ten cases of complaint against the works, the real fault is with the ore; and the only way to remedy these natural evils is to place the works on the dumps of the mines.

I write from a full knowledge of the facts, based on very careful study and much practical experience, and no man in San Juan County could be more directly benefited by a different condition of affairs. The time will come when concentration of our ores will be very desirable and profitable, and certain mines to-day could quite advantageously adopt methods for this purpose, while others can even now afford to take advantage of the facilities afforded by custom mills. I propose to discuss this branch of the subject more in detail hereafter, but shall probably devote my next communication chiefly to the consideration of the very important subject (to investors) of the distribution of ores in this district.

There are some very excellent opportunities for the investment of capital in metallurgical works designed for the reduction of certain classes of our ores, and I hope to recur more minutely to this theme after I have mapped out the positions and detailed the characteristics of our veins. The whole subject teems with interest to the student from every point of view, whether scientific or commercial. THEODORE B. COMSTOCK.

SILVERTON, COLO., Aug. 16.

THE FLOOD ROCK WORK.—Capt. James Mercer, of the United States Engineers, in immediate charge of the excavations at Flood Rock, Hell Gate, states that the work was in part resumed about the middle of July, and that the force of men has been increased until it now numbers from fifty to sixty, while the maximum number (probably not far above 100) will be engaged as fast as the conditions will warrant—in other words, as fast as places can be found for them. He said that, on account of the delay of Congress in granting the necessary appropriations, the

* This has since been added to the mill.

final upheaval of the rock would probably not take place until the fall of next year. General Newton asked in February for an appropriation, but Congress did not grant it until July, and because of electrical conditions in summer and because extreme cold is unfavorable to such extensive operations with the explosives used, the firing of the mine can not very well take place at an earlier date. The rock covers about nine acres; about eight acres are undermined. The engineers have a very difficult question to decide as to whether three quarters of an acre more can be undermined, inasmuch as the formation of the rock is such as to make it possible, if not probable, that the leakage would be so great that the mine could not be kept free of water, even with the powerful engines now at work at every mine night and day.

FURNACE, MILL, AND FACTORY.

Another pair of Rand compressors have been ordered for the Hydraulic Power Company's plant, at the Little Quinnesec Falls, Mich.

It was announced in Pittsburg, on the 19th, that the Coal Valley Coal Company had been compelled to ask for an extension from its creditors. A member of the firm has confirmed the report, but declines to go into details. From another source, it was learned that the First National Bank of Pittsburg was the principal creditor. A bank official states that he does not think the indebtedness will exceed $300,000, and will probably fall below that figure. The assets of the company, he was satisfied, were greatly in excess of the liabilities. Their inability to meet the obligations is entirely due to the depression in the coal trade.

A meeting of the creditors of James A. Stone & Co., large operators at Pittsburg, Pa., has been arranged to be held in a few days, when it is thought the extension asked for will be granted. The liabilities are in the neighborhood of $300,000, and the assets are estimated at over $500,000. Their embarrassment is caused by the general depression of the coal trade.

It is rumored that when the Crown & Cumberland Steel-Works are in successful operation at Cumberland, Md., there is a probability of a steel nail factory being started near the works by entirely different parties.

The Pittsburg *Telegraph* reports that the leading demand in the market just now is for galvanized and polished sheets. The Apollo mill is on double as to puddlers, and eight trains are booming along on triple turns, with orders three months ahead. The same favorable report is given at the Pennsylvania Works of Everson, Brown & Co. The puddlers are on double turn and the three sheet-mills are on triple. On the guide-mill, nothing but pipe iron is made, but this is idle this week. At Scottdale, the most favorable reports come as to the sheet-iron business. The mill is on double in the forge and the rolls triple. At the Republic Mills, South Side, every thing is on double turn. The two sheet trains are on work for polished sheets. Jones & Laughlin have sheet-mill trains on double turn, the product of which is nearly all polished. At the Juniata Iron Mills, sheet-iron is beginning to be rolled again, although it has been some four or five months since any has been made.

Shoenberger & Co., Juniata Mill, Pittsburg, are making nails of a mixture of one third low carbon steel and two thirds iron.

Oliver Brothers & Phillips, Pittsburg, are erecting another cupola and steel converter, the counterpart of the one now in operation so successfully. The new plant will be completed within three months. The output of both will be about 160 tons in twenty-four hours, which is far beyond the muck capacity of the largest mill in the city. This improvement will have been made all within twelve months, and is the most important, relating to iron that has been accomplished in many years.

A fire occurred recently at the lead-works of Price & Co., Pittsburg, which occasioned a loss of $30,000.

Vulcan furnace, Mich., will be started up again in a few days. Lee Burt's patent water-backing will be put in before the furnace goes into blast, and it is expected that this improvement will effect a large saving on repairs to the hearth.

A meeting of the stockholders of the Harrison Wire Company, of St. Louis, has been called for September 25th, to vote on a proposition to increase the bonded indebtedness of the company from the present amount, $150,000, to $250,000.

The erection of a blast-furnace is contemplated at Renfroe, Ala., by D. W. Rogers & Co., who have extensive saw, planing, and shingle-mills at that place.

A large Worthington steam-pump is being put into position in the Old Boston colliery of the Delaware & Hudson Coal Company at Poke Hollow, Pa.

The improvements at Lucy Furnace No. 1, Pittsburg, are so nearly completed that the furnace could be put in blast in a week's time. The *American Manufacturer* says that it is exactly like No. 2, which was altered and improved last year. Therefore, in describing No. 1 we describe both. Hight of stack, 80 feet; diameter at top, 16 feet; at bosh, 20 feet; at bottom, 11 feet. At these furnaces, no men are employed at the top, the charge being carried up in self-dumping cars, which run on an inclined plane. Lucy Furnace No. 2 made 6370 tons of pig iron during July. This is an average of 205⅓ tons a day, or 1438⅓ tons a week. Ten years ago, half this was considered an astonishing output for a 20-foot furnace. In fact, we believe 700 tons a week were never made ten years ago, except perhaps as a "spurt." But think of 1800 tons in a week, which at least one 20-foot Pittsburg furnace has made.

LABOR AND WAGES.

The coal miners of the Cañon City Coal Company at Rockville, Colo., are still on a strike that they inaugurated about four weeks ago. The number of men out of employment in these mines is about 200. The strike was caused by the company reducing the tonnage from $1.25 to $1.10, and the miners refused to accept the 15 cents reduction.

The report that the strike of G. B. Markle & Co.'s employés at Jeddo and Highland, Pa., had been terminated by the unconditional surrender of the operators, is denied. The operators made a proposition to the strikers, but the latter declined to accept it, and unless the operators accede fully to the miners' demands, the strike will continue. Markle & Co. have agreed to abandon the "cut-throat" receipt system, and have notified a committee of strikers to this effect. This is looked upon as a surrender, and the men agreed to return to work on Monday, August 16th.

The men at Illiana, Ill., have been notified that, from September 1st to October 1st, the price of mining will be 75 cents a ton, and from October 1st 80 cents, and 80 cents a yard for narrow work and $2 a day for day work. The prices were formerly $1.10 a ton and $6 a yard for narrow work without the coal, or $2.50 a yard and $1.10 a ton for the coal. The above is all for room and pillar work. The mine has heretofore been worked on the long-wall system, and the price was $1.10 a ton, and the men gave 10 cents off the ton to get a pay-day every two weeks. There was a reduction of 10 cents on the first of April last, so that left 90 cents a ton.

The Coal Exchange composed of dealers operating the Monongabela River mines, met at Pittsburg, Pa., August 20th, and ordered a general reduction in wages, and also took action looking to the abolition of the lockage tax that they are compelled to pay to the Monongahela Navigation Company for the shipment of their craft through the locks to Pittsburg. The reduction in wages ordered was a uniform rate of 2½ cents a bushel for the first, second, and third pools, and 2 cents for the upper or fourth pool. This is a cut of one cent from the price demanded by the miners when the strike that is still in progress was inaugurated three months ago, and half a cent less than that offered by the operators at the same time. The operators claim that, owing to the heavy competition of the Kanawha region and the depressed condition of trade, they are unable to pay any more. The miners assert that the reduction was ordered for effect, and that its object will miscarry, as it will only result in making the strikers more determined to stand out for their original demand of 3½ cents a bushel. About 5000 men are now idle, and will not go in until the district price is paid. The Coal Exchange also decided to petition Congress to purchase the Monongahela Navigation Company improvements and make the river free. They claim that the present tax for lockage is so heavy as to make it impossible successfully to compete with the lower districts, where the government has charge. A bill will be presented to Congress at the next session, and vigorously pushed to that end.

While Clifford Daubert and Joseph Manning, miners employed at the Cameron colliery, at Pottsville, Pa., were blasting in the breast on August 20th, a premature explosion occurred in a neighboring chamber, which broke down the partition between the breasts, instantly killing Daubert and fatally injuring Manning.

Warrants have just been issued by 'Squire Dawson, of Coal Center, Pa., on the oath of officers McBurney and McClure, of the coal and iron police, for the arrest of all miners in the camp at Wood's Run for conspiracy. Warrants have also been issued for the arrest of President Costello and a number of campers for refusing to assist an officer in the discharge of his duty, and for obstructing the execution of legal process. Detectives are swearing in assistants to aid them in making arrests, and trouble is anticipated. A large number of Neel's men have returned to work, and reports from the third pool say that the strikers are weakening, and at two pits the men have gone in.

RAILROAD NEWS.

A charter was issued at Harrisburg, Pa., on the 15th, to the Eastern & Western Air-Line Railroad Company, which intends to build a road from Lawrence to Jefferson County, 112 miles long. The capital stock is $5,600,000. Waldorf H. Phillips, of New York, is credited with the ownership of 22,364 of the 23,000 shares.

COAL TRADE NOTES.

COLORADO.

The mine inspector reports that the Colorado Coal and Iron Company is opening up the Crested Butte mine about a quarter of a mile from the place where the disaster occurred a few months ago, in which so many miners lost their lives. The company is simply opening up the old vein in a new place. Mr. Neil says that the old mine is at present only worked in the upper level. The miners are not allowed to use any powder in the old workings, nor naked lamps, as none but safety-lamps are permitted in the mine.

MARYLAND.

The Lonaconing *Review* for August 15th reports that Jackson and 'Coney have been working full-time. Koontz has been working over-time, in order to make up for time lost during the repairs of damages by the flood. Detmold mines have been idle several days, owing to a scarcity of cars that was caused by a scarcity of vessels at Locust Point. Ocean, full-time. Midland, full-time. Miller, half-time. Alleghany, full-time. New Hope, full-time. Borden, half-time. Borden Shaft, half-time. Blaen Avon, three-quarter time. Eckhart and Hoffman, full-time. Hampshire and Franklin resumed operations on Monday, and have been working full-time since. Phœnix is idle, the Cumberland & Pennsylvania not having been yet repaired to that point, but it is thought they will start the beginning of next week. Potomac and Swanton are idle, the railroad not having been repaired to that point. The damages to the switch of the Potomac mine will be repaired this evening, so they will be ready to start to-morrow morning. They expect to load the empty hoppers in the switch, and then wait for the railroad. Pekin mine resumed operations yesterday, and will ship its coal up the road until the lower end is repaired.

OHIO.

The State Line bank at East Palestine ran steadily during the month of July, the output of coal being about 12,000 tons. The men do not do very well, owing to the bank being crowded.

The firm of Ridgeway, Burton & Co., of Chapman, has sunk a new shaft on the land of Mr. Benjamin Fulton, near that place, and has discovered a good seam of coal, and is making the necessary openings for large shipments. The new mine will be known as the Blaine shaft, though it is possible some of the coal may be shipped to Cleveland.

The coal mines of the Belfont and Lawrence rolling-mills, located at the Tunnel, six miles back from Ironton, are idle, owing to a proposed reduction in the price of mining from 75 to 65 cents a ton, the miners refusing to accept. Some coal for the mills has been received by barges from other points. The Belfont furnace is averaging about 53 tons daily. The coal miners of the Kelly Iron Company have resumed work, and the mill, burned in May last, and now rebuilt, is again in blast.

Averick's shaft, at Steubenville, is working moderately about four and five days a week. Bustard's, little more than one-half time. The High shaft is running steadily, but is stacking up a great deal of coal. The rest of the mines are idle. Our other branches of industry are running well.

NATURAL GAS.

Beatty & Sons, Steubenville, who operate the large tumbler-works, have laid a two-inch pipe from their works to the Jefferson Iron Company's gas-well and are now using gas to run part of their works. Gill & Brothers, who operate a glass chimney factory, are putting down a gas-well about 800 feet from their works, and are now down to the depth of about 600 feet. This firm has been idle for five weeks, but is now heating up and making all haste to begin operations. The Jefferson Iron Company is sinking another gas-well not far from the one now flowing. Should it hit another vein of gas equal to the one it now has, it is said that it will have enough to run the entire works and some to spare.

PENNSYLVANIA.

ANTHRACITE.

The second tunnel at the Girard colliery was finished recently, and the vein was found to be twenty feet thick. The tunnel is 237 feet in length, and has been in operation since last November. About two months were lost by the contractor on account of the flooding of the mines last winter. John Griffiths, of Shenandoah, had the contract of both tunnels, and Messrs. Veith, Gregory, and other officials pronounce the work first-class. The one taps the north dip of the Buck Mountain at a distance of 212 feet and the coal is 17 feet thick. The other taps the south dip of the same vein, about 20 feet in thickness. There will be about 17 feet of clear coal, the rest being slate and dirt. Work is pushed rapidly, and in about two months both tunnels will be feeders of the breaker, which will greatly increase the tonnage.

A special dispatch to the New York *World*, dated August 20th, says: The Buckridge slope, sunk in 1874 by May, Audenried & Co., of Shamokin, and now owned by the Philadelphia & Reading Coal and Iron Company, was found to be on fire at four o'clock this morning. The slope is 1500 feet deep, and the fire originated in the fan-house at a depth of 1200 feet. The flames have ascended

rapidly, and this afternoon issued from the mouth of the slope. As the timbers supporting the roof of the mine are consumed, heavy falls of coal occur, and the roar of the fire can be heard quite a distance. To-day, the Coal and Iron Company purchased and took possession of the Greenback colliery, located near by, and a hole has been started from that colliery into the workings of Buckridge, a distance of thirty-six feet, which should be completed by to-morrow, when a running creek will be turned into the mines through this hole. The fire will force both collieries into idleness for probably six months. The damage to Buckridge slope will be very heavy. It is supposed that the journal of the fan became heated and ignited. Seven hundred men and boys are thrown out of employment.

A new slope is driving at the Old Boston colliery of the Delaware & Hudson Coal Company between Plymouth and Kingston. It will open up a point containing large anthracite deposits where the Cooper and Bennett veins run together, making a very thick vein to work from.

The new Baltimore slope Red Ash shaft is now down two hundred and thirty feet. The colliery belongs to the Delaware & Hudson Coal Company. Direct-acting hoisting-engines of a very large size, and a pair of new conical drums ten feet in diameter, have lately been put in at the company's plant.

James McAlarney, of Plymouth, has under lease over 4500 acres of coal land, and owns 506 acres more that are connected with his Glen City colliery, in the lower region south of Berwick. He is to lease the whole property at an early date.

The new Mill Creek shaft that is going down at the instance of the Delaware & Hudson Coal Company, a short distance above Wilkes-Barre, has attained a depth of 125 feet. The sinkers have just struck hard-pan after going through forty feet of quicksand. This dangerous element was successfully conquered by them, and the appearances would indicate that they will receive no further trouble from it. The dimensions of the shaft are ten feet by twenty-two feet.

BITUMINOUS.

The mines at Alpsville, employing about 125 men, are not doing very well at present, not making more than two-thirds time. Osceola mines are employing about one hundred men and working not much over half-time, but are looking forward to more steady work.

No. 4 Penn Gas-Coal Company mine, at Sewickley, is not doing so well as last reported. For the last month, it has not been making more than two thirds time. The reason assigned is, that it can not get cars enough to ship its coal. The same trouble seems to be found at all the Penn Gas-Coal Company's mines, unless it may be No. 2, which is probably doing better. There are 240 men employed at No. 4, and three cents a bushel, over an inch and a half screen, is the price paid for mining. Amieville mine, about half a mile below Sewickley, is doing well, employing upward of two hundred men, and the same price is paid for mining. Latimore's, about half a mile above, is not doing so well, not making more than two-thirds time. The old Paper Mill mine started up again about a week ago, with prospects of running steadily for some time. It has about thirty men employed, and will likely soon increase the force.

From the Clearfield District, the Osceola *Reveille* reports that the Vandusens have leased the coal from the representatives of the Madera Coal and Improvement Company, on the William Sheff tract of land, and that they have become the owners of all the property belonging to the Beaver Run Coal Company on this tract, formerly William Kendrick & Co., and will work the slope driven in by the late William Kendrick, which is located at the upper end of West Houtzdale, in connection with their own work—Houtzdale colliery. We have also learned that Fisher & Miller have purchased the coal underlying the farm of John M. Jordan, adjacent to Beulah Church, a mile away from Ramey, and that they will, in a short time, drive a work in on it.

COKE.

The Mount Braddock coke-works have been sold at auction to Mrs. Catharine Tinstman for $610, subject to purchase mortgage for $100,000, which is held by Robert Hogsett.

The Connellsville Coke Producers' Association met in regular monthly session at Pittsburg, August 20th. There was a full attendance and harmonious action throughout. The question of further restriction was considered, and it was decided not to decrease the output. The falling off in shipments for July, as compared with June, was 2000 cars. This was considered satisfactory, inasmuch as July is a very dull month in iron, and coke necessarily sympathizes with the iron production. It was not as great a decrease, however, as from May to June. The syndicate account showed $100,000 for distribution. The ovens are now making the best coke ever produced, it being all 72 and 96-hour coke. The restriction percentage remains at 45 per cent; but as the ovens are running all the time, there is really no greater restriction than there was at the previous restriction of 25 per cent and two days idle each week.

NATURAL GAS.

The drill has struck a good flow of gas in the well of Moorhead, McCleane & Co., Soho Iron-Works, Second avenue, Fourteenth ward, Pittsburg. The drill has been sent ninety feet deeper, as the contract calls for 1050 feet, and it is probable a stronger pressure may be got. The well is quite shallow for a producer in this region, being about 600 feet less in depth than the Westinghouse.

A large vein of gas has been struck at the Lemon-Bissell well, a mile south of McKeesport.

Mr. Westinghouse has purchased all the gas rights and properties of the firm of Guffey, Gailey & Co., containing 17,000 acres of land. The properties are principally located in the Butler and Tarentum gas-fields.

WEST VIRGINIA.

NATURAL GAS.

A vein of gas was struck recently at the Hobbs gas-well at Wellsburg. The vein struck proved to be fine dry gas, and was found 1300 feet down in the center of a heavy stratum of sandstone.

GENERAL MINING NEWS.

ARIZONA.

RAY COPPER.—Advices from the Thurber say that the Ray Copper Company is pushing things ahead vigorously. It is just now putting up a sheet-iron roofing to protect the machinery in case of rain. The smelter has a capacity of working 100 tons in twenty-four hours. It has from 6000 to 7000 tons of rich copper ore already on the dumps.

UNITED VERDE.—The shaft on the Wade Hampton mine is down to a depth of 130 feet, and is in a large body of ore. The smelter is running successfully on sulphuret ore, turning out daily from fifteen to twenty tons of matte that runs from 65 to 75 per cent in copper, and is rich in silver. The company has large bodies of carbonate ore uncovered, ready to be taken out at any time and run through the furnace. From fifty to sixty tons are run daily through the thirty-ton smelter, and ten men are all that are required to take that amount of ore out.

GRAHAM COUNTY.

DETROIT.—The company's new stone store building at Morenci is completed, and will be occupied at once. It is one of the largest and most complete mercantile warehouses in the county. Its dimensions are 40 by 75 in the clear. It is divided into several compartments, the largest, 26 by 40 feet, being the store proper. The interior has been given a hard finish. The building is well lighted and ventilated throughout.

ARIZONA COPPER.—The Arizona Copper Company has but two furnaces blown in at present. On account of the low stage of the water in the San Francisco River, it was necessary to blow out one furnace last week. For the week ended Saturday, August 9th, the company shipped black copper as follows:

Dates.	No. pounds.
Monday, 4th	25,007
Tuesday, 5th	25,788
Wednesday, 6th	25,960
Thursday, 7th	26,877
Friday, 8th	13,795
Saturday, 9th	40,629
Total	158,056

CALIFORNIA.

PLUMAS COUNTY.

LUCKY S.—A contract has been concluded with the Greenville Iron-Works for a quartz mill to be placed on the Lucky S. mine. Work on the mill will begin immediately, and will be pushed till the completion of the work. G. W. Aylesworth will have charge of the carpentering to be done. Only five stamps will be put in at present, but the mill will be so constructed as to enable the company to add five when it wishes to do so. The ditch has been completed and the water turned in. There are about one hundred inches of water.

COLORADO.

ARAPAHOE COUNTY.

A telegram to the Denver *Tribune-Republican* says: A very rich strike of lead carbonates has been made on a claim near Diggs Mill, about five miles from the Calumet iron mine, in this county. There has been some excitement in the vicinity for the last ten days over some high-grade float that had been found, but this is the first discovery of mineral in place. A large number of prospectors will leave Salida for the new camp. The claim is called the Ontario, and is owned by Henry White, of this place. Pay mineral was reached at a depth of six feet, and to all appearances in very large quantities. It is undoubtedly a deposit.

CUSTER COUNTY.

BULL-DOMINGO.—A meeting of the stockholders of the Bull-Domingo Mining Company took place to-day, and the following gentlemen were elected trustees: Hon. W. H. Barnum, Hon. William Dorsheimer, William M. Lent, H. C. Dickinson, N. B. Stephens, David S. Draper, and Shepard Tappen. The meeting was largely attended, and 138,000 shares were represented. The superintendent at the mine telegraphed August 18th: Winze 48 feet. Ore all the way. The ore-chamber is now 45 by 48 feet, and still in ore. Main shaft progressing rapidly. The manager of the concentrator writes under date of August 11th: We are doing good work and making concentrates beyond my expectations. In seven and a half days' run, we have made 60 tons of concentrates.

GILPIN COUNTY.

CORRY CITY.—The mine, under the energetic development of Messrs. Ballard & Fulton, is looking very well, according to the Georgetown *Courier*. The main shaft is down 245 feet. Fifteen feet above the bottom, drifts have been started east and west, and are already in 14 and 20 feet respectively, with five inches or more of mineral all the way. The last mill-run returned 200 ounces for first-class and 90 ounces for second-class. A "New Era" pump has just been put in. Its capacity of 80 gallons a minute effectually drains the workings. The hoisting apparatus designed by Major Fulton works admirably, the skip being raised from the bottom, dumping itself automatically, and being lowered again to the bottom in less than one minute and a half. It raises 1500 pounds at a time. Besides hoisting the smelting ore and waste rock, it easily handles the 40 tons of concentrating material required daily by the new Corry mill. The lessees seem now to have every thing arranged for a large output from their well-known property. Over four hundred tons of concentrating ore have been received at the Corry mill since it was started up last month. Most of this has been treated, and the result is a demonstration that the air and water processes adopted by Major Fulton are successful. The tailings from some of the Krom machines run so low that reference to the assay-book might be necessary to convince the more stubborn skeptics. They practically show a saving of all the mineral in the ore. A Hartz jig has been put in this week, which will treat the coarsest size from the screens, leaving the Krom machines to handle the subsequent sizes down to the slimes, which are effectively disposed of on the two Rouse tables. Much attention has been paid to the screening, and new methods are testing that promise still better results than those heretofore obtained. The intention is, to get the material carried to its appropriate machine the moment it is properly sized, thus relieving rolls, elevators, and all other machinery of any unnecessary work in handling the same material more than once. The management, besides treating the ore from its own property, the Corry City, is able to buy concentrating material that runs over twelve ounces. The matter of freight, therefore, only remains to cut off many a dump from a cash market. The success of Pay Rock tramway and a little gentleness of spirit from the railroad will undoubtedly soon overcome this last remaining obstacle.

DUNDERBERG.—About fifteen men are employed, who are taking out an excellent grade of ore. The company had made arrangements to begin sinking the shaft in June, but was debarred from beginning work by the damage done to the buildings and machinery by the flood.

VICTORIA TUNNEL.—The strike made in the tunnel, says the *Georgetown Courier*, is of considerable magnitude. The vein encountered can not be definitely determined, but there is a probability of its being the Mendota. A survey will be made this week, when a conclusion may be arrived at. This vein is seven feet in width between the walls. The east side of the tunnel shows a vein of ore three feet in width, 16 inches of which are solid. On the north side, a vein about 18 inches in width is exposed, eight inches of which are solid. The ore is zinc blende, galena, iron and copper pyrites, with a sprinkling of gray copper. The vein was encountered at a distance of 780 feet from the face timbers of the tunnel. Even if this proves to be the Mendota, the present contract will not be completed until the tunnel has reached a distance of 1080 feet.

GUNNISON COUNTY.

WILDER.—Three Rouse concentrating-tables of twenty tons daily capacity will soon be in operation here, in addition to the Embrey tables now running in the mill.

LAKE COUNTY.

The Leadville *Herald* reports that Mr. Loder, in charge of the Estey & Hill concentrating mill previous to its destruction by fire, has made a test on 584 pounds of ore, which assayed 10·25 ounces in silver to the ton. The ore was first run over jigs, by which means the minerals of lead and iron and also the larger portion of the silver was secured. The slimes and sands from the fine jig were then sent to settlers, and next to an ordinary combination amalgamating-pan. After the usual treatment in the pan, the tailings were discharged, sampled, and assayed, showing, it is said, that about ninety-four per cent of the silver contents of the ore had been saved.

AMERICAN SMELTER.—The Leadville *Herald* reports that the American smelter was obliged to blow down two furnaces recently on account of scarcity of ore, the result of bad roads, caused by the recent heavy rains. The furnaces will not be permitted to remain idle very long, as the company has ample ore contracted for, but is unable at present to secure its transportation. The establishment, under the management of M. Bratherton, has been improved and modified until it is at present one of the best arranged in the State for economical working. Among the new labor-saving devices is a novel scale, for weighing

furnace charges. The scale consists of a number of bars, each carrying a separate weight, and arranged by a system of keys to work either singly or in combination with one another. With these scales and a system of tracks, one man weighs the charges for all four furnaces, and a saving of nearly a thousand dollars a month in wheelers and weighers is attained.

COLONEL SELLERS.—The mine, having just concluded another large contract with the Colorado Smelting Company, of Pueblo, has resumed extracting and shipping ores in large quantities.

FOREST CITY.—During the month of July, the Forest City mine sold ore to the amount of $102,000. The expenses were but $12,000, thus leaving a net profit of $90,000. It shows there are some pretty good things in Leadville yet. The ground from which this ore was taken was a year ago looked on as next to worthless. The mine has paid in dividends this year $325,000.

LILIAN.—The Florence mine, on Printer Boy Hill, during the month of July produced and shipped 1133 tons of ore, of fair value, placing the Florence mine in about the third rank of Leadville's producing mines. A few months ago, the Florence and several adjacent mines were consolidated and incorporated in a stock company, known as the Lilian Mining Company, of Leadville. The stockholders are Tingley S. Wood, of Leadville, and John Peters and Frank Leonard, of Springfield, Ill. The capital of the company consists of 200,000 shares, all of which, with the exception of 10,000 shares recently exchanged for property, is owned by the above-named gentlemen. The consolidation now embraces about one hundred acres. During the past few months, the property has produced quite handsomely, leaving a good profit, from which a dividend of ten cents a share, amounting to $20,000, will be declared in a few days.

LITTLE PITTSBURG.—The Little Pittsburg Mining Company received as net mill returns from January 1st to August 1st of the present year $54,307.83. The operations of the company on Little Pittsburg No. 6 have been much troubled with water the last month, and Mr. Gilman found it necessary to increase the drainage capacity by change and addition of machinery.

MORNING STAR CONSOLIDATION.—From Robert E. Booraem, the able manager of the Morning Star Consolidation, on Carbonate Hill, the *Herald* mining reporter has obtained the following statement of the operations of the company during July: The development-work, which has been in progress since May last, from the upper or first level of the McHarg shaft, at a depth of 182 feet from the surface, has opened up some promising territory on the upper contact. Drift No. 32, running south from the shaft, has encountered a body of iron ore apparently of considerable size, as the entire drift is surrounded by it. Assays of from 20 to 40 ounces in silver have been obtained, and the mineral carrying but 8 per cent of silica, with a large excess of iron, will make it a desirable ore. This ore-body is about one hundred feet north of the Evening Star, and it is expected that throughout this teritory considerable ore will be found, which can be readily and economically extracted through drift 32 and the McHarg shaft. This new ore is hoisting at present. During July, 320 tons of ore were shipped from the following shafts, which are operated by the Morning Star Company, and not by lessees:

	Tons.
Kitchen shaft	154
Main workings	118
Forsaken shaft	26
Halfway shaft	22
Total	320

The output for the month averages about 25 ounces and 20 per cent. One lot of thirteen tons from the Kitchen ran 160 ounces and 15 per cent. The total receipts from ore sales were about $7500. The Kitchen workings are still yielding ore of good grade, which is coming from along the Evening Star line. The Halfway has recently met with some new ore and is doing better this than last month. The old main workings, which are worked through the Evening Star mine, have been paying well from the beginning, and there is every reason to believe that they will continue doing as well for some months to come. There are two men prospecting in the Forsaken, where there is but little ore at present. It is the company's intention to start up the McHarg lower workings as soon as arrangements can be made to perfect the pumping plant. The upper and lower Waterloo portions of the Morning Star have been leased since April for six months. In July, 877 tons of ore were shipped, which averaged 14 ounces in silver and 20 per cent in lead. These were the first leases let on the property, and the company has had every reason to be satisfied with this method of working these portions of the property; the lessees being fair and square miners, and the company asking nothing unreasonable of them. Since the spring, active work has been in progress on most of the dumps on the property, with decidedly successful results to the lessees, and consequently to the company, which is due mostly to the fact that the waste does not have to be hauled away, the jigs being worked on or near the dumps. Four hundred and sixty-nine tons were shipped in July of concentrates and sorted ore, which netted from the smelter about $5700.

OURAY COUNTY.

The Mineral Creek concentrator, started up last week, made the adjusting run on ten tons of fourth-class ore from the Congress, a very difficult ore to handle at the best.

PRIDE OF THE WEST.—Messrs. Kingsley and Keller and William Bielefeldt have taken a lease on a portion of the Pride of the West, in Cunningham Gulch. They will put two shifts at work immediately on the ground they have secured.

PITKIN COUNTY.

SPAR.—The Spar Consolidated mine will put in hoisting-works.

DAKOTA.

FATHER DE SMET.—The report of the superintendent from August 7th to August 15th, shows ore extracted from first, second, and third levels, 2050 tons. Ore milled, 2100 tons. Golden Gate, east cross-cut, second level, advanced 12½ feet. Total length, 41 feet. Golden Gate uprise, 8 feet.

IDAHO.

BANNER.—G. W. Crofts took charge of the Banner mine and erected a small mill in 1864. It was not until 1868 that good pay was struck, when in seventy days $116,000 were taken out with twenty stamps. Since then, work has gone on developing, and last year the product was over $125,000. A large lot of ore has been taken out, the mill has been remodeled, and 100 men will soon be at work. This season, the company is taking in 400,000 pounds of machinery, supplies, and salt.

CHARLES DICKENS.—Work has been suspended on this mine, at Bonanza. The late William Norton, a short time before his death, put the mine in the hands of the well-known mining firm of Gilman & Salisbury, giving a deed of trust. Norton's indebtedness is between $193,000 and $194,000. The mine was mortgaged for about $57,000. Norton, several months ago, bought out his partners, Phillips and Rhorer, the price of each of the two interests being $50,000. Phillips and Rhorer each hold a note given by Norton for $45,000. Norton was deeply in debt for labor employed in the mine and for supplies.

MEXICO.

In Nieves, State of Zacatecas, there are four mining companies the capital for which is furnished by foreigners. Of these, the Santa Rita is English, and the Rosario, San Miguel, and Rio Grande are American. Of the former, it is said that, although at present only some 200 meters in depth and about the same in the extension of its works, it will produce 12,000 cargas of ore weekly, averaging 2 marks a carga, which at $8 will give $192,000.

MICHIGAN.

IRON MINES.

According to a tabulated statement, the lake shipments of iron ore for the week ended August 13th were:

	Tons.
Marquette, M., H. & O. lake shipments	424,277
Marquette, M. & W. lake shipments	103,260
L'Anse, Marquette District	39,091
Escanaba, Marquette District	344,225
Escanaba, Menominee District	609,570
St. Ignace, Marquette District	35,384
Total lake shipments	1,555,807

The Marquette *Mining Journal* reports: At this stage of the shipping season one year ago, the quantity of ore forwarded from the Lake Superior District was 1,170,069 gross tons, as against 1,555,807 tons forwarded to date this year, the increase for the current season being 385,738 tons. During the same period in 1882, the shipments amounted to 1,684,686 tons, or 138,879 tons more than the quantity sent to market by lake so far this year.

CLEVELAND.—A second diamond drill has been set at work on the Cleveland Iron Company's property between Negaunee and Ishpeming. The first drill put up on the tract cut a deposit of red hematite, of good quality, but considerably mixed with jasper.

MINNESOTA.—Immediately upon completion of the Duluth & Iron Range Railroad to the town of Breitung, in the Vermilion Iron District, ten cars, each carrying 22 tons of ore, were loaded at the Breitung mine, and the train was at once run down to the lake, where the ore was unloaded on the dock at Two Harbors, on the 1st of the current month, the date long since set for the opening of the road that is to furnish the Minnesota iron field with an outlet to Lake Superior for its ores.

MONTANA.

ELKHORN.—This mine is owned by Holter Brothers, John Kinna, J. H. Shober, and a few shares by Eastern parties. The company declared its first dividend on the 31st of July. The amount of the dividend was $5000, which is ten cents a share, or one per cent on the capital stock of the company. It is expected that dividends will hereafter be largely increased, as in the past the works have been subject to much stoppage, and a large amount of money has been expended in new hoisting and pumping machinery. Some three months ago, at a depth of a little over 300 feet, it was found necessary to quit sinking on account of there being so much water in the lower workings—more than they were able to handle with their insufficient pumping equipment. They have since put in two new boilers and two new Knowles pumps. Sinking has now been actively resumed, and the ore-body in the lower workings averages from 55 to 60 ounces a ton. The ten-stamp mill is now running day and night. New appliances in the way of pans, settlers, amalgamating-pans, roasting-furnaces, etc., have lately been added. From thirteen to fifteen tons of ore are treated daily. The output for June, notwithstanding some ten days' stoppages, was $15,400, and the total expense for the month was $8368, leaving a little over $7000 profit.

LEWIS & CLARKE COUNTY.

ANACONDA.—J. R. Maxwell, engineer in charge of the two Anaconda branch railroads connecting the main line of the Utah & Northern with the mine and smelter of the Anaconda Company, has received a dispatch to stop all work and dismiss the employés. It is believed that a misunderstanding has arisen between J. B. Haggin and the company in regard to freight rates. The branch to the mine was promised to be completed by the 10th inst. The branch from Stuart is in operating order. The smelter would have been finished in fifteen days.

PARROTT.—Another building, 40 by 70 feet, has been raised at the Parrott smelter. It is to be used in the molding of slag-bricks. It is reported that an addition 28 by 100 feet to the new concentrator at the Parrott is to be put up. This addition is to dump the ores in after they have come out of the calcining-furnaces.

MEAGHER COUNTY.

HECLA.—It is reported that the Hecla Company, Glendale, has struck a body of rich ore in the old Trapper mine. The company is extracting from $5000 to $7000 worth of ore daily.

NEVADA.

OSCEOLA.—A correspondent of the Pioche *Record* says: The Osceola Company, an Eastern incorporation, that some twelve months since bought of George Monroe and others a mine known as the Linton & Monroe claim, the consideration being $60,000, has, after a month's trial of said mine, "thrown up the sponge," the speculation being an unprofitable one. Shortly after purchasing this property, the company erected a 20-stamp mill, put hoisting-works on the mine, built roads, boarding and sleeping dwellings for the men, and otherwise expended cash to the amount of $60,000 more, making in all $120,000. The sale of this property, or rather "wild-cat," was consummated through fraud, the would-be expert, Tower by name, pocketing a large share of the purchase-money. In conversation with Supt. J. C. Turner, a few days ago, he said that if the ore went $5 per ton he could have made it pay; as it was, it went $3.50; and sooner than run the company any further in debt, he preferred to abandon the enterprise. Mr. Turner further stated that, as soon as he had cleaned up, the machinery was to be taken apart and reshipped to the makers in Chicago.

THE COMSTOCK LODE.

CONSOLIDATED VIRGINIA AND CALIFORNIA.—The San Francisco *Post* is authorized to announce that a proposition is on foot to consolidate the capital stock, debts, property, assets, and franchises of the California and Consolidated Virginia mining companies into one corporation, to be named the Consolidated California & Virginia Mining Company. The proposed contract is to last for thirty-three years. The capital stock of the new company is to consist of 216,000 shares of the par value of $100 each, or $21,600,000. The new stock is to be issued and delivered to stockholders of the Consolidated Virginia and California mining companies in the proportion of one fifth of one share of the Consolidated California & Virginia Mining Company for each one share of the Consolidated Virginia and California mining companies. The object of this consolidation, as stated by Pres. Charles H. Fish of the Consolidated Virginia, is that of economy. Expenses will be reduced fully one half, as there is to be but one president, one secretary, one superintendent, one office, and one system of working the mining ground. A petition is now circulating among those who have the stock of the Consolidated Virginia and California mining companies standing in their names for their signatures authorizing the change. The law requires that the consent of the holders of two thirds of the capital stock of each company is necessary for this purpose. Mr. Fish stated that every body to whom they had applied, with a single exception, had thus far approved of the plan. In conjunction with the recent consolidation of mining work at the north end of the Comstock lode, the *Post* hails this proposition as indicative of a gradual consolidation of the Comstock into one great mining corporation to be worked upon more business-like principles and for the best interest of all concerned. It may be that the Sutro tunnel will play an important part in this scheme.

UTAH.

SUMMIT COUNTY.

CRESCENT.—The Park *Mining Record* reports that a block of Crescent stock, consisting of 1150 shares, was sold at auction by Messrs. Bamburger & Woolf in Salt Lake this week. Five hundred shares were sold at $1.32½ and the rest at $1.37½. Sheriff Groesbeck was the purchaser. The market value of Crescent stock is $1.65, and this sale of stock was undoubtedly made to break the market; if this was the case, it failed of success.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, August 22.

Business was very dull in the mining market this week, and there is but little of interest to note. The Comstock shares were quiet and steady, as were also the Leadville stocks. The Bodies record no change, except Standard, which was stronger. The Tuscaroras were almost neglected. Horn-Silver rallied, and sold at stronger prices under a fair business. The remainder of the market was noted only for its dullness, and records nothing of special interest. A complete summary will be found below. The total number of shares sold was 68,560, as against 94,420 last week.

The Comstock shares were but moderately dealt in, and sold at steady prices. California sold at 17c., with a small business. Consolidated Virginia was very actively dealt in at strong prices; it sold at from 33@45@42c. Sierra Nevada sold at from $1.50@$1.75, and was but moderately dealt in. Mexican sold at $1.70, and Ophir at $1.20. Sutro Tunnel records a fair business at strong prices; it sold at from 17@22@21c.

The Leadville stocks were quiet and steady. Amie sold at 9c. Chrysolite was a little weak, selling at from 80@75c., with a small business. Dunkin was quiet and steady, selling at from 28@30c. Breece sold at 19c. Leadville sold at strong prices under a small business; it was quoted from 35@40c. Little Chief was quiet and steady at 31@30c.

The Bodie stocks were quiet and sold at steady prices. Standard was strong, under a small business, selling at from $1.50@$1.70. Bulwer sold at 60c. Consolidated Pacific sold at steady prices with a fair business; it was quoted at from 55@59c.

The Tuscarora stocks were very quiet. Belle Isle was very strong, selling at from 85c.@$1@93c., with a fair business. Navajo was quiet and strong, selling at $4.25.

In the miscellaneous list, Alice was strong, selling at $2.75, with a small business. Eureka Consolidated sold at irregular prices under a moderate business; it was quoted at from $2.65@$2 70@$2.50@$2.60. Green Mountain was quiet and steady at $1.90@$1.95. Horn-Silver records a fair business at strong prices, selling at from $5.75@$6. Robinson sold at 27c. Silver King records one transaction at $5.13.

Caledonia suffered a severe decline from its recent strong prices; it sold this week at 50c., and was but moderately dealt in. Central Arizona sold at 22c. Harlem records a small business at 3c. Oriental & Miller was quiet and steady, selling at from 16@14c. Rappahannock was very actively dealt in at strong prices, selling at from 16@18c. Sonora sold at 3c. The State Line stocks were fairly dealt in and sold at steady prices. Nos. 1 & 4 sold at from 4@3c. and Nos. 2 & 3 at from 7@6c.

The following mining stocks were sold at auction this week:

150 shares Sterling Mining Company, at 5 cents a share.

66 shares Farwell Consolidated Mining Company, at 1 cent a share.

300 shares Winona Gold Mining Company, lot at $6.

500 shares Gold Cup Mining Company, lot at $46.

625 shares Trust Gold Mining Company, lot at $6.

300 shares Evening Star Mining Company, lot at $65.

40 shares Veta Madre Milling and Reduction Company, lot at $4.

200 shares American Antimony Company, lot at $5.

150 shares Yankee Smelting and Construction Company, lot at $4.

1000 shares Fletcher Gold and Silver Mining Company, lot at $8.

100 shares Jackson Iron Company, $25 each, at $301.

DIVIDENDS.

The Father de Smet Consolidated Gold Mining Company, of Dakota, has declared a dividend of twenty cents a share, payable August 30th, at the office of Messrs. Laidlaw & Co., No. 14 Wall street, New York City.

The Jocuistita Mining Company, of Mexico, has declared a quarterly dividend (No. 13) of $50,000, being fifty cents a share, payable at the office of Messrs. Lounsbery & Haggin, Mills Building, No. 15 Broad street, New York City, August 30th.

The Ontario Silver Mining Company, of Utah, has reached its 98th dividend, $75,000, for July, payable at the company's office, San Francisco, or by Messrs. Lounsbery & Haggin, Transfer-Agents, No. 15 Broad street, New York. The Ontario's dividend payments now reach the large sum of $5,750,000.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report for the week as follows:

The oil market this week has been active and bullish, having advanced from the opening, Monday, 75⅞, to 85½ to-day. The advance is due to the decline of Wardwell Ferry and the action of producers in agreeing to curtail production. The tone and temper of the market point to still higher prices. The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Aug. 16	$0.75⅞	$0.77¾	$0.75⅞	$0.76½	4,445,000
18	.76¼	.76⅞	.75½	.76½	4,253,000
19	.76½	.79	.76⅜	.78¾	6,193,000
20	.79	.80⅞	.79	.79⅝	6,039,000
21	.79¾	.82⅝	.79¾	.82½	6,328,000
22	.83¾	.85½	.83½	.85¼	6,392,000
Total sales					33,650,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Aug. 15.	Aug. 16	Aug. 18.	Aug. 19.	Aug. 20.	Aug. 21.
Albion	...	...	...	...	...	...
Alpha	...	...	...	...	...	...
Alta	2⅝	2¼	2½	2	...	2⅛
Argenta	...	...	...	...	...	...
Bechtel	...	...	...	...	...	...
Belcher	1	.85	.95	.95	...	.85
Belle Isle	...	...	...	...	...	...
Best & Belcher	2½	2⅜	2¼	2¼	...	2¼
Bodie	2⅜	2	2⅜	2	...	2
Bullion	...	...	...	...	...	...
Bulwer	...	...	...	...	...	...
California	.10	...	.10	.10	...	.10
Challar	3¼	2½	2⅛	2	...	1⅞
Con. Pacific	.55	...	.55	...	...	...
Con. Virginia	.30	.30	.35	.40	...	.40
Crown Point	1⅜	1½	1½	1⅜	...	1¼
Day	...	...	...	...	...	...
Elko Cons	...	...	...	...	...	...
Eureka Cons	...	...	...	...	...	...
Exchequer	...	...	...	...	...	...
Gould & Curry	2¼	2	2	2	...	2
Grand Prize	...	...	...	...	...	...
Hale & Norcross	2⅜	2¾	3	2⅞	...	2⅞
Independence	...	...	...	...	...	...
Martin White	...	...	...	...	...	...
Mexican	2	1⅝	1⅝	1½	...	1½
Mono	...	...	...	...	...	...
Mount Diablo	...	...	...	...	...	...
Navajo	4⅛	4	4⅛	4⅛	...	4
Northern Belle	...	...	...	...	...	...
North Belle Isle	...	...	...	...	...	...
Ophir	1⅜	1¼	1⅛	1⅛	...	1⅛
Overman	...	...	...	...	...	...
Potosi	1¾	1½	1¼	1¼	...	1⅛
Savage	1	.95	1	1	...	.95
Scorpion	...	...	...	...	...	...
Sierra Nevada	2	1½	1½	1½	...	1½
Silver King	...	...	...	...	...	...
Tip Top	...	...	...	...	...	...
Union Cons	1⅝	1½	1¼	1⅛	...	1¼
Utah	1¼	1	1	.80	...	80
Wales Cons	...	...	...	...	...	...
Yellow Jacket	...	2	2	2	...	1¾

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, August 21.

The market for the copper stocks continues to rule steady, without any special feature. The transactions for the week have been light, and prices are very little changed. Calumet & Hecla continues to be the leading favorite, and although at one time it declined to $163½ it quickly recovered, and sold to-day at $165, which was the asking price at the close of business this morning. The election of officers of the company was held this week, and the annual report that was submitted shows a very satisfactory financial condition. Quincy continues in steady demand at $36@$36½ ex dividend $2½ per share, which is paid to-day. Franklin sold at $7, an advance of $¼ since last sale, July 23d. Huron sold at $1⅛, and is, we consider, one of the best investments on the list. There were no sales of Atlantic or Osceola this week; but the former is in demand at $7 bid, and the latter at $12 bid, $13 asked. In the remainder of the list, there is no activity.

In silver stocks, Bonanza sold at $1, same as before. Dunkin Silver has been quite active, and advanced to 31c. A dividend of 5 cents a share, $10,000, is announced, payable next month. Bowman is dull at 10@12c. Catalpa, sales at 25c. and bid. Sullivan, 8c. bid, 10c. asked. Empire, neglected. Bijou sold at 12½@13c., same as last week. The market for mining stocks, outside of the leading coppers, is dull enough, and there seems to be no disposition on the part of the outside public to take hold of them at present. The rapid rise in railroad stocks the past month has absorbed the attention of speculators in that direction: but we feel inclined to the belief that there is money to be made in legitimate mining operations, and that the public will again buy them at the low figures at which they are now selling.

3 P.M.—At the afternoon Board, there was nothing doing, and prices were unchanged. Closing bids: Calumet & Hecla, $160 bid, none offered. Osceola, $12 bid. Quincy, $36 bid, $36½ asked. Dunkin, 30@31c.

BULLION MARKET.

NEW YORK, Friday Evening, August 22.

DATE.	London. Pence.	N. Y. Cents.	DATE.	London. Pence.	N. Y. Cents.
Aug. 16	50¾	110⅛	Aug. 20	50¾	110⅛
18	50¾	110⅛	21	50¾	110⅛
19	50¾	110⅛	22	50¾	110⅛

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank gained £81,820 bullion, and the proportion of its reserve to its liabilities was raised from 41 13-16 to 43 11-16, against 46 11-16 per cent at this date last year.

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of July.	Year from Jan. 1st, 1884.
		$	$
*Alice, G. S.	Mont.	†	520,843
*Belmont	Mont.		8,081
Bodie, G.	Cal.		396,063
*Bonanza King, S.	Cal.		211,904
*Boston & Montana, G.	Mont.		239,779
*Chrysolite, S. L.	Colo.	13,113	98,478
*Consolidated Bobtail, G.	Colo.		47,280
*Contention, S. G.	Ariz.		314,929
*Deadwood-Terra, G.	Dak.		260,923
*Derbec Blue Gravel, G. S.	Colo.	16,196	89,813
*Father de Smet, G.	Dak.	43,999	267,637
Grand Prize, S.	Nev.		25,000
*Hecla Cons., G. S. L. C.	Mont.	‡	320,052
Helena, S. L.	Mont.		164,000
*Homestake, G.	Dak.		607,988
*Hope, S.	Mont.		39,301
Horn-Silver, S. L.	Utah.		1,444,000
*Iron Silver, S. L.	Colo.		581,356
*Kentuck, G. S.	Nev.	1,717	20,577
*Lexington, G. S.	Mont.	96,794	709,479
*Little Pittsburg, S.	Colo.	3,355	56,304
*Moulton, G. S.	Mont.	61,241	432,147
*Mount Diablo, S.	Nev.		24,820
*Navajo, G. S.	Nev.	34,667	243,697
North Belle Isle	Nev.	5,874	5,874
*Ontario, S. L.	Utah.		1,021,841
*Original, S. C.	Mont.		29,724
*Oxford, G.	N. S.	2,471	22,378
*Paradise Valley, S. G.	Nev.		45,164
*Plymouth Consolidated, G.	Cal.	91,189	623,546
*Rooks, G.	Vt.	6,328	28,661
*South Yuba, G.	Cal.	2,400	18,016
*Stormont	Utah.	17,847	117,595
*Syndicate, G. S.	Cal.	14,067	98,078
*Tombstone, S. L.	Ariz.		370,078
United Gregory, G.	Colo.		7,174
Total amount of shipments to date			$9,312,583

* Official. † Assay value. ‡ Not including value of lead and copper. ** Silver valued at $1.05 an ounce. G. Gold; S. Silver; L. Lead; C. Copper. —— No bullion produced.

METALS.

NEW YORK, Friday Evening, August 22.

Copper.—The trade remains quiet, although it appears that maneuvering for position for the forthcoming Lake sale is beginning, an impression prevailing that it may come off at 13½c. We quote for Lake nominally 14c., and for other brands 12¾@13½c., according to quality.

London cables for Chili Bars to-day £54 2s. 6d., and for Best Selected £59 6d.

Tin.—The market has been quiet, and has receded to 18½c. Straits spot, large lines, and to 18⅛@18¼c. for futures. London cables £82 5s.

Lead.—Early in the week, a few hundred tons of lead were sold at 3·60c. On Tuesday, however, a sale was made at 3·55c., evidently for effect, and since then the trade has been so frightened that little business has been done. It is surmised by some who are well informed that the object of making low quotations is a preliminary step to a

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Aug. 16. H.	Aug. 16. L.	Aug. 18. H.	Aug. 18. L.	Aug. 19. H.	Aug. 19. L.	Aug. 20. H.	Aug. 20. L.	Aug. 21. H.	Aug. 21. L.	Aug. 22. H.	Aug. 22. L.	SALES.
Alice, Mon..	2.75						2.75						600
Belle Con., Co.					.09								200
Argenta													
Bassick, Co.													
Belle Isle, Ne.	.85		1.00	.95	.95		.93						1,100
Bodie Cons., Ca.													
Breece, Co.									.19				200
Bulwer, Ca.	.60												100
California, Ne.							.17		.17				700
Cal. & Hecla, Mich.													
Castle Creek					.18								100
Chollar													
Chrysolite, Co.	.80		.80				.75						500
Cons. Va., Ne.	.37	.33	.37	.35	.40		.45	.40	.39		.42	.38	22,000
Copper Queen									4.50				100
Dunkin, Co.	.28						.30						400
Eureka Cons., Ne.			2.65				2.70		2.70		2.60	2.50	550
Father de Smet, Dk.													
Findley, Ga.													
Gold Stripe, Ca.													
Gould & Curry, Ne.													
Grand Prize, Ne.													
Green Mountain, Ca.	1.95	1.90	1.95										2,200
Hale & Norcross, Ne.													
Hall-Anderson, N. S.													
Homestake, Dk.	9.50												200
Horn-Silver, Ut.	5 88	5.75			5.75		5.75		6.00	5.75	6.00		1,165
Independence, Ne.													
Iron Silver, Co.													
Leadville C., Co.			.35				.40	.35	.40				450
Little Chief, Co.					.31	.30							400
Little Pittsburg, Co.													
Martin White, Ne.													
Navajo, Ne.			4.25						4.25				500
Northern Belle													
North Belle Isle, Ne.													
Ontario, Ut.													
Ophir, Ne.											1.20		200
Quicksilver Pref., Ca.	29.00												100
" Com., Ca.					5.50								100
Robinson Cons., Co.									.27				200
Savage, Ne.													
Sierra Nevada, Ne.			1.70		1.75		1.55		1.50		1.75		875
Silver King, Ar.					5.13								100
Spring Valley, Ca.													
Standard, Ca.	1.50								1.70				420
Stormont, Ut.													
Tip Top, Ar													
Vizina, Ar.													
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Aug. 16. H.	Aug. 16. L.	Aug. 18. H.	Aug. 18. L.	Aug. 19. H.	Aug. 19. L.	Aug. 20. H.	Aug. 20. L.	Aug. 21. H.	Aug. 21. L.	Aug. 22. H.	Aug. 22. L.	SALES.
Albion													
American Flag													
Barcelona, G.													
Bechtel Con., G.													
Belvidere													
Best & B'licher, G. S.													
Big Pittsburg, S. L.													
Bradshaw, S.													
Bull-Domingo, S.L.													
Cal., B. H., G.											.50		1,000
Central Ariz'na, S.									.22				100
Climax, Co.													
Colorado Central.													
Cons. Imperial													
Con. Pacific	.59	.58	.55		.58	.57	.58	.57	.59		.59	.57	2,900
Decatur													
Durango, G.													
Eastern Oregon													
Goodshaw, G.													
Harlem M. & M. Co.							.03						100
Hortense, S.													
Lacrosse, G.													
Mariposa Pref., G.													
" Com., G.													
Mexican, G. S.											1.70		100
Mono													
North Standard, G.													
N. Horn-Silv'r, S. L.													
Pri'nt'l & Miller, S.	.16								.14				2,700
Rappahannock, G.	.18	.16							.18		.18		11,400
Red Elephant, S.													
Ruby, of Arizona.													
Silver Cliff, S.													
Sonora Con.									.03				200
South Bodie, G.													
South Bulwer, G.													
South Hite													
South Pacific													
State Line, 1 & 4, S.	.04	.03							.03				3,200
" Nos. 2 & 3, S.	.07	.06									.06		6,650
Sutro Tunnel	.19	.17							.21	.19	.21		6,750
Taylor Plumas													
Unadilla, S.													
Union Cons., G. S.													

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 33,460. Non-dividend shares sold, 35,100.

bull movement. With the busy season close at hand, very low prices do not seem warranted in reality.

Messrs. John Wahl & Co., of St. Louis, telegraph to us as follows to-day :

In sympathy with other markets, an increasing dullness characterized our lead market. Since the date of our last report, prices have further declined, and sales have been made as low as 3·37½c. for Refined lead. We quote Hard lead nominally 3·35c.

From Chicago, Messrs. Everett & Post send us the following dispatch :

Absence of buyers is effecting a decline. The market is very flat and weak at nominally 3⅝c. Some sellers are anxious to sell, but do not want to name lower prices than 3·40c. Offerings are only moderate, but more than sufficient to meet present consumptive demands.

Spelter.—The market is dull at 4·60c. for Domestic. London cables £14 17s. 6d. for Silesian.

Antimony.—Business is quiet, with Cookson's at 10⅝c. and Hallett's at 10⅛c.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, August 22.

American Pig.—The market has been quiet, with a less decided disposition of outside brands to force sales, and a correspondingly firmer tone in some of the standard brands.

We quote standard brands : No. 1 Foundry, $19@$20.50 ; No. 2, $18@$19 ; and Gray Forge, $17.50@$18.50, with outside brands from 50c.@$1 lower. Foreign Bessemer is nominally $19@$19.50. Spiegeleisen is nominally $27.50@$28 for 20 per cent, a small business having been done during the week.

Scotch Pig.—The market continues quiet, in spite of slightly higher cable quotations.

We quote ex ship and to arrive : Coltness, $21.50 ; Langloan, $21.50 ; Summerlee, $20.75; Dalmellington, $20 ; Gartsherrie, $21 ; Eglinton, $19.25@$19.50 ; and Glengarnock, $20@$20.50.

At the Metal Exchange, the following cable quotations have been received : Coltness, 59s. 6d. ; Langloan, 54s. 6d. ; Summerlee, 52s. ; Gartsherrie, 52s. 6d. ; Glengarnock, at Ardrossan, 49s. 6d. ; Dalmellington, 47s. 9d. ; and Eglinton, 44s. Warrants, 41s. 6d.

Steel Rails.—Inquiries for small lots are quite umerous, and the business in the aggregate is large ; but buyers have apparently become so accustomed to a constant decline that they can not resist the temptation of making very low bids, especially as $27 is known to have been shaded for a few desirable large lots. We quote $27@$28 at mill. It is evident that the few mills now working must be soon filled up to capacity, and that then the others, who have closed down on account of low prices, will only start with higher figures.

Old Rails.—Business is quiet, with quotations at $18@$18.50 nominally for Ts.

Philadelphia. August 22.

[From our Special Correspondent.]

Pig-Iron.—Good qualities of Gray Forge iron are selling here in moderate-sized lots at $16.50. The brands which are held at $17 and $17.50 are neglected. There has been more of a run on low than high-grade brands. The market is not perceptibly stronger than a week ago, but there are indications that it will be stronger next week, and this expectation is based on inquiries which have been coming into market for two or three days, some of them for large lots of forge iron ; but this business will not be done except at a decline of from 20 to 50 cents a ton from lowest prices that have been named. All sorts of prices have been named, and a good many offerings of inferior irons have been made. The indications of an improving business are seen on all sides, but something must happen to induce buyers to depart from their hanging-back policy. Forge has sold at $15.50 ; Foundry irons might be dismissed without a remark. Founders are not buying any more than they need, and at $19.50@$20 for No. 2. Sales of No. 2 at $18.25@$18.50, but all small lots. A speculative inquiry was made for large lots of Pig, Forge, and Foundry, on a basis of about $16.50 and $18.50 for Forge and No. 1 Foundry, delivered here. As these figures barely cover cost, it is not likely that any very heavy business will grow out of these offers.

Foreign Iron.—There are buyers in market for Bessemer and from 2000 to 3000 tons have been sold at about $20@$21 for the best makes and $19 for ordinary makes. Spiegeleisen is weakening under no demand.

Muck-Bars.—One party sold a lot of Muck-Bars at $29 at mill ; 300 or 400 tons have been marketed.

Blooms.—From 1000 to 1500 tons of Blooms have been sold, or are likely to sell within a few days. One or two sales were made at very little over $50 for charcoal blooms ; anthracite $40, although quotations are given at $55 and $45 for best makes. There are several buyers in the market, and bloomaries expect to capture a good deal of work between this and the end of the month.

Merchant Iron.—One well-known manufacturer refused offers for several lots of Merchant Bars at 1·90c., and demands 1·95c., as he is well sold up, but nearly all the others are glad to get business at 1·90c. or 1·80c. One party was in the market for Skelp iron, and several bids were made at 1·90c., but the buyer found a taker at 1·80c. Ordinary prices, 1·80@1·90c. for Merchant iron. Car-works demand a little off, and Common iron is to be had at 1·65c.

Plate and Tank-Iron.—Plate and tank are dull, but prices have not weakened because there are plenty of inquiries in the market, and there are several buyers waiting for an opportunity to place large orders. The firmness in prices is also due to the facts that mills are well sold up, and that there is no room for further shading. Plate is 2·10c. ; Tank, 2·15c. ; Shell, 2.75c. ; Flange, 3·75c. ; Fire-Box, 4·25c.

Structural Iron.—The Detroit Bridge Company placed an order for 1800 tons, but Eastern makers were not fortunate enough to capture it. At present, no one knows where it went, but it is believed that the Union people of Buffalo got it, being advantageously situated with regard to freights. There are inquiries for several thousand tons. Angles are 2·10c. ; Bridge Plates, 2·25c. ; Tees, 2·75c. ; Beams and Channels, 3·40c.

Sheet-Iron.—For some reason, the past week has brought forth very little business. Small lots Best Refined are selling at 3½@4c. Out of town establishments have been making heavy deliveries during the past week, and have been looking up new business, but buyers are determined not to place large orders at present prices.

Wrought-Iron Pipes.—More business is done in pipe ; but if rumors are true, it was secured at some concessions from quotations, which are 30 per cent off for Butt-Welded Black Pipe, 20 for Galvanized, Lap-Welded Black, 50c. ; Galvanized, 35c., and Boiler Tubes, 47½c.

Nails.—It is said to-day that nails have sold in this market at $2.10. Manufacturers are loath to give bottom figures, but are anxious for business on the

best terms possible. Store lots have sold as high as $2.35@$2.40. Some new concerns are making trouble; and unless there is an organized restriction, there will be more trouble.

Steel Rails.—The steel rail market has got down to $27@$27.50 for small lots. If this does not mean $26@26.50 for large lots, then the usual difference in prices for large and small lots is not maintained. Two large companies here declare they know nothing of business at $25 in Pittsburg. It is intimated that $26 might possibly be taken, but nothing has been done at any such figure. Some large contracts have been placed. The total amount is variously estimated, but it is known that large winter requirements have been provided for, and that large additional contracts will probably be placed, and it is said that political probabilities have actually something to do with it.

Old Rails.—Old rails are quiet. There are offers in hand for 1000-ton lots of recognized quality at $18, f. o. b. The sellers want a little more. Six hundred tons of bull-heads went to Catasauqua, at about $20.50 here. They are from South America, and are of extra quality. Several other transactions are likely to go through.

Scrap-Iron.—There is nothing to say as to scrap. No. 1, $19@$19.50. Lots of selected are held in yards at $20@$21, no sales. Two or three lots of wrought turnings sold at $15@$15 50.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, August 22.

Anthracite.

Matters in the coal trade have taken a turn for the worse, as might be well expected, when an attempt is made to push the product of a week upon an already overstocked market. Our shipping ports are simply clogged with coal awaiting shipment, and naturally concessions are freely and universally made to set coal moving. Buyers, it may well be imagined, are not in a mood to place large new orders, and the result is a state of affairs that borders on the critical. We have no desire to write in an "I told you so" spirit; but we are sure that even the most thoughtless in the trade are beginning to arrive at the conclusion that there is something wrong in a system that has brought it to such a condition. We have attempted editorially to present some of the questions that are pressing for settlement. Next week is to be another week of full production and commensurate pressure, and then a week's stoppage is to give the unfortunate sellers of coal a breathing spell. This will give some relief, but not enough, and the companies would do best to decide at once upon a second week's stoppage in September, and be prepared to follow up with at least one week, if not two weeks, in October.

J. H. Jones, official accountant, has issued the following statement of the anthracite coal tonnage for the month of July, 1884, as compared with the same period last year. This statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines:

	July, 1884.	July, 1883	Difference.
Phila. & Reading RR ...	954,777	1,026,481	D. 71,704
Lehigh Valley RR.....	488,7 2	497,741	D. 9,02
Del., Lack. & West. RR.	443,847	427,646	I. 16,201
Del. & Hud Canal Co..	†281,949	279,262	I. 2,687
Pennsylvania RR ...	297,427	240,609	I. 56,818
Pennsylvania Coal Co..	111,520	121,597	D. 10,077
N. York, L. E. & W. RR.	24,373	22,349	I. 2,024
Total	2,602,615	2,615,686	D. 13,071

	For Year 1884.	For Year 1883.	Difference.
Phila. & Reading RR...	5,662,308	*6,417,135	D. 754,827
Lehigh Valley RR... ..	3,079,365	3,346,470	D. 267,105
Del., Lack. & West. RR	2,682,935	2,644,714	I. 38,221
Del. & Hud. Canal Co .	1,704,499	1,810,423	D. 105,924
Pennsylvania RR.....	1,741,857	1,449,578	I. 292,279
Pennsylvania Coal Co..	701,659	774,780	D. 73,121
N. York, L. E. & W. RR.	189,245	183,353	I. 5,891
Total.....	15,761,868	16,626,454	D. 864,585

* This amount includes 1,745,398·19 tons carried by the Central Railroad of New Jersey during the first five months of 1883.

† In addition, there were 39,307 tons transported from mines by the Delaware & Hudson Canal Company, during July, which is included in tonnage of other interests.

The stock of coal on hand at tide-water shipping points, July 31st, 1884, was 672,267 tons; on June 30th, 1884, 704,838 tons; decrease, 32,571 tons.

The percentage of the total tonnage carried by each company for the seven months was as follows:

	1884.	1883.
Philadelphia & Reading.....	35·9	38·6
Lehigh Valley	19·5	20·1
Delaware, Lackawanna & Western	17 0	15·9
Delaware & Hudson Canal Company.....	10·8	10·9
Pennsylvania Railroad.....	11·1	8·7
Pennsylvania Coal Company	4·4	4·7
New York, Lake Erie & Western.....	1·2	1·1
Total.....100·1		100·1

Mr. Jones's figures show that on August 1st the collieries were only 865,000 tons behind last year's record. Last year, the August output was 3,325,000 tons; this year it will not be less than 3,400,000, and probably more, so that we begin September with only about 750,000 tons less than last year.

Bituminous.

Those of the Cumberland companies whose shipments have been hampered by the recent flood are getting into shape. The market continues in a demoralized condition, with little prospect of an early rise in prices, favored as they are by prevailing low freights.

Philadelphia. August 22.

[From our Special Correspondent.]

Stocks at Port Richmond, 52,573 tons. A gradual increment is in progress. Vessels are not quite so plenty, but plenty enough for the urgent requirements. The demand for South Atlantic ports is still fairly active. Freights to Boston are $1@$1.10. It is now practically agreed that there will be a two weeks' suspension in September, but nothing definite has been said. The matter will come up for discussion in a few days, informally at least, and it is probable that the restriction party will win, as there are plenty of reasons for it. There are still a good many disturbing influences at work in the trade. Manufacturing requirements in all markets, as well as the local trade, are backward. The Delaware & Hudson Canal Company, for the last week, sent 110,049 tons, against 93,181 tons—an increase of 16,868 tons for the week over the same week last year, or, for the season, a decrease of 116,114 tons. The Reading Company has an abundance of orders on hand, and its agents report probability of a more active demand after the first of the month. A great many consumers are deferring purchasing. The New England demand will improve after the first of the month, according to the best opinions here. The Southern requirements are beginning to look up. Inquiries for large lots are in hand from the West. No very early orders, however, are looked for. The smaller sizes are in most demand. Manufacturing sizes are called for irregularly. Yards are filling up, in view of active domestic demand. Shipments are improving on the line trade. There is a local agitation in reference to coal charges, which is having its effect. The fact is commented upon, that employés of the railroad company are supplied with coal, delivered, at $3.70 a ton, while outside buyers are paying $6.50 delivered. Attempts are also making to show systematic dishonesty in the weighing of coal. All this makes interesting reading, but does not affect the trade, except to hold back buyers. The furnace demand in Eastern Pennsylvania is very light. As long as the iron trade is so dull, there will be no improvement. The manufacturers whose orders are expected to boom trade at this time are refusing to take their usual supplies. Supplies for school-houses are quite a factor, and deliveries are rapidly made. The general opinion among the leading coal spirits here is, that there will be a general improvement in demand, but specific reasons can not be given.

The production of bituminous coal for the week is given at 58,077 tons for the Clearfield region, against 50,059 tons for the same week last year—an increase of 8000 tons, and an increase for the year of 151,753 tons. Several new openings will be made this fall, in view of the possibilities of better demand next spring. A great deal of valuable bituminous territory is penetrated by rail facilities. There is nothing of particular moment in the bituminous trade, apart from the heavy deliveries. Cumberland production for the week, 41,778 tons, against 39,014 tons for the same week last year. The increase for the year is 118,809 tons, making the increase of bituminous coal from both sections sent to Eastern markets, about 278,000 tons for the year so far. This showing does not tell well for the much talked of invasion of hard-coal markets by the soft coal trade.

Buffalo. August 21.

[From our Special Correspondent.]

The anthracite coal trade remains *in statu quo* The receipts and shipments are large, but the stocks on hand are only moderate. Cars are short here for shipment West. It is said that, generally speaking, all the rolling stock in the shape of cars is now in motion, either East or West, hence the difficulty of procuring rail freight accommodation from this point Westward.

The stocks at Chicago, Milwaukee, Superior City, and Duluth are said to be on the move at last; country orders are filling, as dealers are beginning to purchase for winter use. It is also reported that for some reasons (unknown, of course, to the dear public) the Western markets are weak. Dealers have felt the pressure of the times, and are desirous to realize—a significant indication. At what figures are the Western retailers procuring their coal?

There is some talk of another advance in prices early in September, but nothing definite has been elicited from those interviewed.

Bituminous coal is unchanged; no new features of interest.

Coke is without any change of consequence.

A prominent firm of this city, which violates, like many others, the smoke ordinance by consuming bituminous coal, was brought to trial at the Municipal Court, on Monday last. The defendants took the ground that the Common Council had no jurisdiction in such matters. The decision of the point was reserved. A similar case, which was hotly contested in Chicago lately, went to the appellate court, and judgment was given in favor of the city.

The Merchants' Exchange passed appropriate resolutions on the death of Frank Williams, and his funeral was largely attended.

Coal freights on Monday last were weak, according to shippers' views, but owners did not see matters in the same light. Result in favor of vessel men. Freights are firm at unchanged quotations, and with every appearance of steadiness; for the large fleet that arrived Wednesday was chartered in advance in nearly every instance. The following rates were paid per net ton: To Superior City, 60c.; to Marquette, 60c.; to Chicago, Milwaukee, Green Bay, Houghton, and Marinette, 70c.; to Kenosha, 80c.; to Sheboygan, 75c.; to Port Huron, 30c.; to Port Arthur on contract; to Detroit, 25c. per gross ton; to Toledo, 20c. per gross ton; and to Windsor, 30c. per gross ton. Closing strong with no evidence of weakening.

The shipments of coal from Buffalo by lake thus far this season exceed three quarters of a million of tons net.

Shipments by lake from August 14th to 20th, inclusive, 44,480 tons, namely, 21,160 tons to Chicago, 6840 tons to Milwaukee, 4490 to Port Arthur, 1830 to Toledo, 1880 to Kenosha, 1000 to Marquette, 900 to Marinette, 750 to Sheboygan, 1250 to Green Bay, 630 to Houghton, and 1850 to Detroit.

Receipts by lake the past week, none.

Receipts by Lake Shore & Michigan Southern Railroad for the past week 468 tons, 252 tons for Buffalo and 216 tons for other points.

Receipts by canal for the week ended the 14th, 8094 tons; shipments for the same period, 225 tons.

The shipments by canal for the past week include one load coal to Rome at 65c. net, captain to pay unloading; and 3 loads coal-dust to Syracuse at 65c. gross, captain to pay unloading. Nominal rate to New York $1.37½ per gross ton, and to Albany $1 per gross ton, the captain to pay unloading.

The following libel on the coal trade is going the rounds: A frightful accident is reported from a Buffalo coal-yard. As every one knows, or ought to know, when a load of coal is placed on the scales and weighed, the weigher rings a signal to the driver: one bell means "all right;" two bells, "throw coal off;" three bells, "put more coal on." A new clerk had just been placed in the office, and finding that the "ton" only weighed 1100 pounds, he rang the bell three times. The driver of the coal-cart fell dead of shock, and the horse, an animal that had been in the business for seventeen years, was so startled at the unaccustomed sound that he ran away, killing a prominent citizen and fatally injuring seven candidates for the shrievalty. The sad event has cast a gloom over the community. The clerk has been discharged.

There are no railroad items of interest this week. With the thermometer from 90 to 95 in the shade, all ordinary ambition of the average reporter becomes etherealized.

Receipts of coal at Duluth for the week ended August 16th, 14,317 tons; total for the season, 185,977 tons.

Boston. August 21.

[From our Special Correspondent.]

The coal market at this port is in a very quiet condition. The bears seem to be having it all their own way, and the recent Wall street attacks have doubtless had an unsettling influence. It is well for coal buyers to take with "a mental reservation" those statements of production that the newspapers are publishing. A few days ago, the Boston *Herald*, in giving comparative figures on production, was 4,000,000 tons out of the way, on the bear side. The item was a New York special dispatch. The market is doubtless less firm than before full-time work began, particularly for New York coals. Nevertheless, company coal can not be bought in the open market below $4.25 f. o. b. for Stove. Outside coal may be had readily at $4.10@$4.15. Whether the market will stiffen up so that September will realize present asking prices is a question. The restriction of one week next month will help on this movement. But it must be remembered that coal is not selling at lowest figures, as is the case with nearly all other commodities.

We continue our f. o. b. quotations nominally as follows: At New York, Stove, $4.25; Broken and Egg, $3.65; individual coals, $4.15@$4.20 for Stove, $3.50 for Broken and Egg. At Philadelphia, $3.90@$4 for Stove, $3.65 for Chestnut, $3.35@$3.50 for Broken and Egg, $2.50 for Pea. Special coals, $4.85 for Broken, $5.35 for Stove.

The bituminous coal trade has lately come as near to being surprised as this sensation can now be realized in that circle by the announcement of low contract figures. This was in the case of the Boston Water Board contract for 2500 tons Cumberland to be delivered on cars at Mystic wharf in September, November, and April. The contract was taken at $3.58 (!) by the West Virginia Central & Pittsburg Railroad and Coal Company, mining Elk Garden Coal. We append the other bids: New Central Coal Company, $4 a ton; Darrow, Mann & Co., $4.05; J. E. Lockman, $3.90; Gay & Parker, $3.90; Maryland Coal Company, $3.75; O. D. Witherell, $3.73; C. A. Campbell, 1700 tons at $3.75, and 800 tons at $3.90; R. H. Chipman, 900 tons at $3.90, 800 tons at $3.95, and 800 tons at $4.15.

It will thus be seen that the successful bid was 15 cents below the next lowest. Does this indicate the kind of market we are coming to, or is it a piece of individual speculation?

There is very little cargo business in bituminous coal to report. Nominal figures for delivered coal continue $3.60@$3.70.

There is an easy feeling in freights with inside figures, as quoted, obtained on large vessels. Most of the culm coal now coming forward is from Cape Breton. We quote:

New York, 85c.@90c. a ton; Philadelphia, $1.05@$1.10; Baltimore, $1.10@$1.15; Newport News, $1@$1.10; Richmond, $1.20; Bay of Fundy, $1.30; Cape Breton, $1.50.

There is a fair amount of business reported by retailers. Quotations remain unchanged. We quote:

White ash, furnace, and egg	$5.50
" " stove and nut	5.75
Red ash, egg	6.00
" " stove	6.25@ ....
Lorberry, egg and stove	6.75@ 7.00
Franklin, egg and stove	7.50
Lehigh, furnace, egg and stove	5.75
" nut	5.72

Wharf quotations: $4.35, Broken; $4.75, Stove.

STATISTICS OF COAL PRODUCTION.

Belvidere-Delaware Railroad Report for the week ended August 16th:

	Week.	Year. 1884.	Year. 1883.
Coal for shipment at Coal Port (Trenton)	2,995	57,741	68,188
Coal for shipment at South Amboy	13,767	373,690	418,633
Coal for distribution	14,416	439,199	488,266
Coal for company's use	4,419	114,159	98,788
Total	35,597	1,014,789	1,073,875
Increase			
Decrease		59,271	

Comparative statement of the production of anthracite coal for the week ended August 16th, and year from January 1st:

TONS OF 2240 LBS.	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Wyoming Region.				
D. & H. Canal Co.	110,049	2,217,732	93,181	2,333,846
D. L. & W. RR. Co.	141,645	3,026,343	124,223	2,954,786
Penna. Coal Co.	35,016	762,726	36,130	844,522
L. V. RR. Co.	37,417	827,289	24,687	834,678
P. & N. Y. RR. Co.	7,304	133,600	5,152	128,400
C. RR. of N. J	*	*	*	1,202,078
Penn. Canal Co.	†	214,440	16,706	253,469
North & West Br. RR.	16,793	516,862	6,870	280,919
	348,224	7,698,992	306,949	8,832,698
Lehigh Region.				
L. V. RR. Co.	106,418	2,687,153	104,228	2,970,377
C. RR. of N. J.	*	*	*	1,126,889
S. H. & W. B. RR.	4,879	138,505	2,380	36,577
	111,297	2,825,658	106,608	4,133,843
Schuylkill Region.				
P. & R. RR. Co	261,271	6,460,995	160,220	4,314,546
Shamokin & Lykens Val.	*	*	34,112	885,083
	261,271	6,460,995	194,332	5,199,629
Sullivan Region.				
N. Line & Sul. RR. Co.		43,411	1,098	38,513
Total	720,792	17,029,057	608,987	18,204,683
Increase	111,805			
Decrease		1,175,626		

* Included in tonnage of the Philadelphia & Reading Railroad.

† Report not received.

Total same time in 1879.....15,374,328 tons.
" " " "1880.....13,195,348 "
" " " "1881.....16,798,470 "
" " " "1882.....17,301,166 "

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 125,693 tons, as compared with the corresponding period in 1883.

Comparative Statement of the Production of Bituminous Coal for the week ended August 16th, and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Cumberland Region, Md.				
Tons of 2240 lbs.	65,045	1,703,932	59,225	1,494,909
Barclay Region, Pa.				
Barclay RR., tons of 2240 lbs.	5,046	192,085	6,791	195,069
Broad Top Region, Pa.				
Huntington & Broad Top RR., of 2240 lbs.	3,263	118,330	3,102	114,584
East Broad Top			267	26,409
Clearfield Region, Pa.				
Snow Shoe	3,402	114,277	4,441	147,195
Karthaus (Keating)	1,388	22,836		
Tyrone & Clearfield	58,454	1,919,985	49,548	1,758,545
Alleghany Region, Pa				
Gallitzin & Mountain	6,303	229,457	8,245	273,536
Pittsburg Region, Pa.				
West Penn RR.	5,089	174,607	4,251	260,748
SouthwestPenn. RR.	1,034	85,353	1,992	66,580
Pennsylvania RR.	3,066	172,846	15,247	353,636
Westmoreland Region, Pa.				
Pennsylvania RR.	26,458	805,418	36,315	857,940
Monongahela Region, Pa.				
Pennsylvania RR.	2,733	94,068		
Total	181,284	5,633,194	189,424	5,549,151
Increase		84,043		
Decrease	8,140			

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended August 16th, and year from January 1st:

Tons of 2000 pounds.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Gallitzin & Mountain (Alleghany Region)	2,408	82,712	956	54,663
West Penn. RR.	80	24,865	1,310	65,837
Southwest Penn. RR.	51,929	1,392,143	43,130	1,305,929
Penn. & Westmoreland Region, Pa. RR.	4,406	118,845	3,600	140,246
Monongahela, Penn. RR.	1,517	49,340		
Pittsburg Region, Pa. RR.		136		501
Snow Shoe (Clearfield Region)	603	14,566	192	12,206
Total	60,943	1,682,607	49,188	1,579,382
Increase	11,755	103,225		

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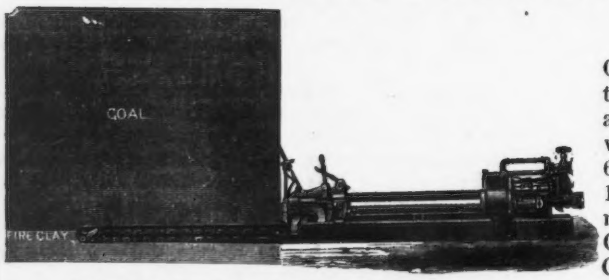

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